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Belgian Water-Supply Competition.

IT has been officially intimated that the King of the Belgians has offered a prize of 1,000*l.* for the best essay on the method of providing large towns, especially Brussels, with a cheap and abundant supply of good potable water. The competition is open to all the world, and, as the matter will not be decided and the prize awarded until 1893, competitors will have five years to mature their plans. Exceedingly little has been published in English on the water-supply to the cities of Belgium, with the exception, perhaps, of that to Antwerp. We therefore propose to say something about the alimentation of Brussels, Liège, and Antwerp, laying particular stress on that to the Belgian metropolis, which is the main object of the competition.

The city of Brussels stands on a hill, at the foot of which runs the river Senne, about 15 mètres above the level of the sea. The water of this river is highly polluted by sewage, and quite undrinkable. The alluvium of the Senne, like most similarly-situated deposits, is water-bearing; but from the fact that it is simply the river-water filtered by the sands and gravels of the alluvium, only the mechanical impurities are thus removed, and the organic impurities chemically dissolved in the water to a great extent remain. In the summer time this water is always of bad quality, yet it is still utilised by domestic wells in the lower part of the city.

The higher parts of Brussels extend up to 60 and 65 mètres above the sea level, and the alternating sands and clays of the Eocene Tertiary beds at these heights are drawn upon by private wells. The most important water-bearing strata which form the principal source of supply to the domestic wells of the city are known as the Bruxellien and Ypresien sands, which are held up by the impermeable Ypresien clay beneath,—a bed of corresponding age to our London clay. The water at this level is good in certain places, but in others the large number of houses which have been erected of late years, together with the drainage of cemeteries, tend to contaminate it. Beneath the Ypresien clay there are artesian strata, the sands of the upper Landenien beds, and lower still the chalk. Unlike the hydro-geological formation of that name under London, however, the chalk is only a very few feet in thickness under Brussels, and in some places is entirely missing, so that the supply from this level is not so bountiful as might otherwise be the case. When the chalk is present the water in it is held up by Silurian rocks.

More than fifty artesian wells have been made in the city and suburbs, the details of which are published in the "Explication de la Feuille de Bruxelles" of the Geological Survey of Belgium. The water level as shown by them is established at 18 mètres above the sea level in those of the lower parts of the city, which is rarely above the 23-25 mètres levels. When the surface of the ground is below 18 mètres, the water overflows generally at the rate of about 305,000 litres per hour. In certain of these wells the water is slightly saline, but it is of good quality as a rule.

The public water supply is based on a system of draining tunnels driven at some depth into the water-bearing sands of Eocene age, which act as filters, and give an excellent water of medium hardness, and very suitable for drinking purposes. The tunnels extend, as the crow flies, to 20 kilomètres towards the south, one part under the Bois de la Cambre and the Forêt de Soignes, the other in the direction of Waterloo, Brain l'Alleud, Lillois, and Baulers, not yet carried out in its entirety.

Since the year 1601, however, the sources of the Broubelaer, a small river near the city, have also been utilised. These rise to the surface about 51 mètres above sea level, and nominally give 1,000 cubic mètres per day, though the actual output is only 600 cubic mètres.

The sources of the Hain, a small river rising 5 kilomètres to the north of Nivelles, 120 mètres above sea level, also furnish a considerable volume of water. This ordinarily gives 19,000 cubic mètres per day, but frequently it runs as low as 13,000 and 14,000 cubic mètres. It is to augment this amount that draining tunnels have been made towards the south and joined to the Hain aqueduct.

At the end of the summer of 1884 the three systems for public supply produced 37,600 cubic mètres of water per day,—600 from the Broubelaer, 29,000 from the Hain and extensions, and 8,000 from the Bois de la Cambre and the Forêt de Soignes.

Summarising the water supply to Brussels at the present time, both private and public, we find that private wells utilise the water of,—

1. The alluvium of the Senne, in the lower part of the city,—of bad quality.

2. The Bruxellien and Ypresien sands, which supply almost all the private wells of the high and middle parts of the city. It is generally good, but not always.

3. The artesian upper Landenien sand, not much drawn from.

4. The artesian strata (chalk, &c.) held up by the Silurian rocks. This is of good quality and largely drawn upon in the higher parts of the city.

The public supply is derived from,—

1. The sources of the river Broubelaer.

2. The sources of the Hain augmented by underground drainage tunnels in the water-bearing Bruxellien and Ypresien sands.

3. The drainage galleries of the Bois de la Cambre and the Forêt de Soignes made in the same formations.

The public water, even in the driest years, never runs short, but might be increased in amount to advantage from many points of view. It is of excellent taste, containing only a little carbonate of lime, but is rather dear, which forms the basis of continued agitation and complaint. It has been proposed to increase the output by further extending the drainage systems, but many objections have been raised against this, principally on the ground of exhausting private wells. The state and the communes, therefore, do not at present feel inclined to grant the necessary powers of extension.

For many years schemes have been devised for supplying Brussels from a distance. The foremost project of this description, and one which has received the most careful consideration, is that by M. Ed. Dusart as embodied in his works, "Mémoire sur un Projet de Distribution d'Eau de l'Ourthe dans les Villes de Namur, Charleroi, Bruxelles, &c., &c.," and "Refutations des Critiques au Sujet du Projet . . . . de l'Ourthe." M. Dusart proposes to bring the water of the river Ourthe, a tributary of the Meuse in Eastern Belgium, by means of aqueducts, to Brussels, supplying the cities of Namur, Charleroi, &c., *en route*. Propositions have also been made to utilise the rivers Heyoux and Senne; and to pierce a series of large artesian wells, forcing the water to required heights by machinery.

The population of Brussels, with its eight suburbs, is estimated now at 454,410, and, allowing a consumption of thirty gallons per head per day, the volume to be supplied would be 13,632,300 gallons per day. It is a rising place, however, and at least 20,000,000

gallons per day would have to be laid out, as a very probable requirement in course of time, though it might not be necessary to provide more than two-thirds of that quantity, or less, at the present time, by reason of the extensive use of private wells. A great deal would depend on how the legislature dealt with the owners of wells in which the water is of inferior quality. Brussels is not a manufacturing city, and does not, therefore, require any excessive quantity of water, so that thirty gallons per head is a fair allowance.

Turning now to the city of Liège it is gratifying to notice that a complete account of the water supply has just been written by MM. Rutot and Van den Broeck, entitled "Les Galeries d'Eaux alimentaires de la Ville de Liège," and published in the "Mém. de la Soc. Belge de Géologie, etc.," vol. i. (1887), p. 242, *et seq.* The general water supply of Liège is similar to that of Brussels, consisting of an extensive system of underground drainage galleries or tunnels driven into a water-bearing stratum on the higher grounds surrounding the city; only, instead of sands of Eocene age they are made in the chalk, without having the advantage of supplementary streams. The three principal collecting galleries are arranged in a T-shaped form on the high ground to the north of the city. The western arm of the T,—known as the "Galerie Ouest," — commences at Hognoul, and, dipping slightly, runs as far as Lantin; the eastern arm, "Galerie Est," commences at Liers, being also slightly inclined, joins the western at Lantin, the water of both being conveyed and augmented by the southern arm,—"Galerie principale,"—to Ans, a western suburb of Liège, where the reservoir is situated, and whence the water is distributed. The eastern and western sections are driven entirely in the water-bearing chalk, but the southern or delivering section, in order to get the necessary gradient, is made partly in the underlying coal-measures, and in consequence is, to a certain extent, unproductive. Vertical shafts allowing access to the tunnels are made at intervals along the different lines of route. The water is of good quality, but, like all that from the chalk, is rather hard. It is a great improvement on the old methods which utilised the water-bearing alluvium of the river Meuse, small springs, minor collecting galleries near the city, &c. The health of the inhabitants is also greatly improved.

In regard to the water supply to Antwerp, none of the preceding systems of drainage is available. The city stands on an alluvial flat, having no high ground in its vicinity in which either the necessary tunnels or the service reservoirs could be made. Formerly the inhabitants obtained their supply from wells sunk in the sandy soil, often in close proximity to cesspits into which the greater part of the drainage of the city was directed. Some of the large establishments used water taken from open canals, which was very impure, being fearfully polluted by various matters. Since June, 1881, however, the city has been plentifully supplied with that necessary of life by the Antwerp Waterworks, which were constructed by Messrs. Easton & Anderson, at a cost of 280,000*l*. These works are situated at Waelhem, about 11 miles south of the city, the water of the Nethe, a tributary of the Scheldt, being used at that place. The quality of the water in its crude state is inferior, and before constructing the works, protracted experiments were made as to the best means of purifying it by filtration. At length it was decided to adopt spongy iron in addition to the sand, gravel, &c., after the fluid had passed through settling-tanks; and it is stated that not only is the hardness of the water considerably reduced by this process, but that the action of the iron is such as to in a great measure destroy the bacteria found in it. The water is sent by continuous pumping through the main to Antwerp. The works were laid out to supply 150 litres, or 33 gallons, per head per day for 175,000 inhabitants, but, according to arrangement, they were only actually constructed in regard to those at the intake and main to Antwerp for 40 per cent. of that amount. This sufficiently shows that an enormous quantity of water from other sources must be used by private establishments in the city.

A noticeable feature in construction is the very treacherous nature of the ground at Waelhem, where the tanks, reservoirs, &c., are made. The ground is part of the alluvial deposit of the great river system of the Low Countries, being made of thin strata of clay, running sand and peat alternating with each other, and holding a considerable quantity of water. This evil was remedied in a great measure by making the filters, &c., water-tight both from within and without, and driving piles for building upon.

The severe winters often freeze over large bodies of water in reservoirs in Belgium, and cause so much inconvenience that special means have to be adopted to remove this defect. Even in the most exposed districts of Lancashire properly treated filter-beds are not affected by frost. Yet in Belgium the winter climate is such as to render it imperative, in extensive works like those now under consideration, to prevent the water from freezing. The designers of the Antwerp waterworks arranged that the temperature of the water should be raised by the injection of steam into it, whenever considered necessary.

The geological structure of the central portions of Belgium is particularly favourable for the construction of the underground galleries driven into water-bearing strata to which we have adverted, and remembering the advantages derived from having a supply close at hand, especially to Continental cities like Brussels, it would seem that energy might fittingly be employed to devise schemes to develop the resources of the different aquiferous strata surrounding and under the city, rather than of the more remote sources. The underground water, moreover, is of a higher temperature in winter than surface waters, such as would be conveyed by aqueducts from distant sources, which is also a decided advantage. Legislation should remove the objections raised by the few owners of private wells, the water in which might be affected by any extended scheme of general supply, but it will be next to impossible for the competitors in the forthcoming competition to work on this basis with any degree of success, until they know what the Belgian Legislature will do in this respect.

THE VENTILATION OF SEWERS.

BY JOHN PHILLIPS, C.E.

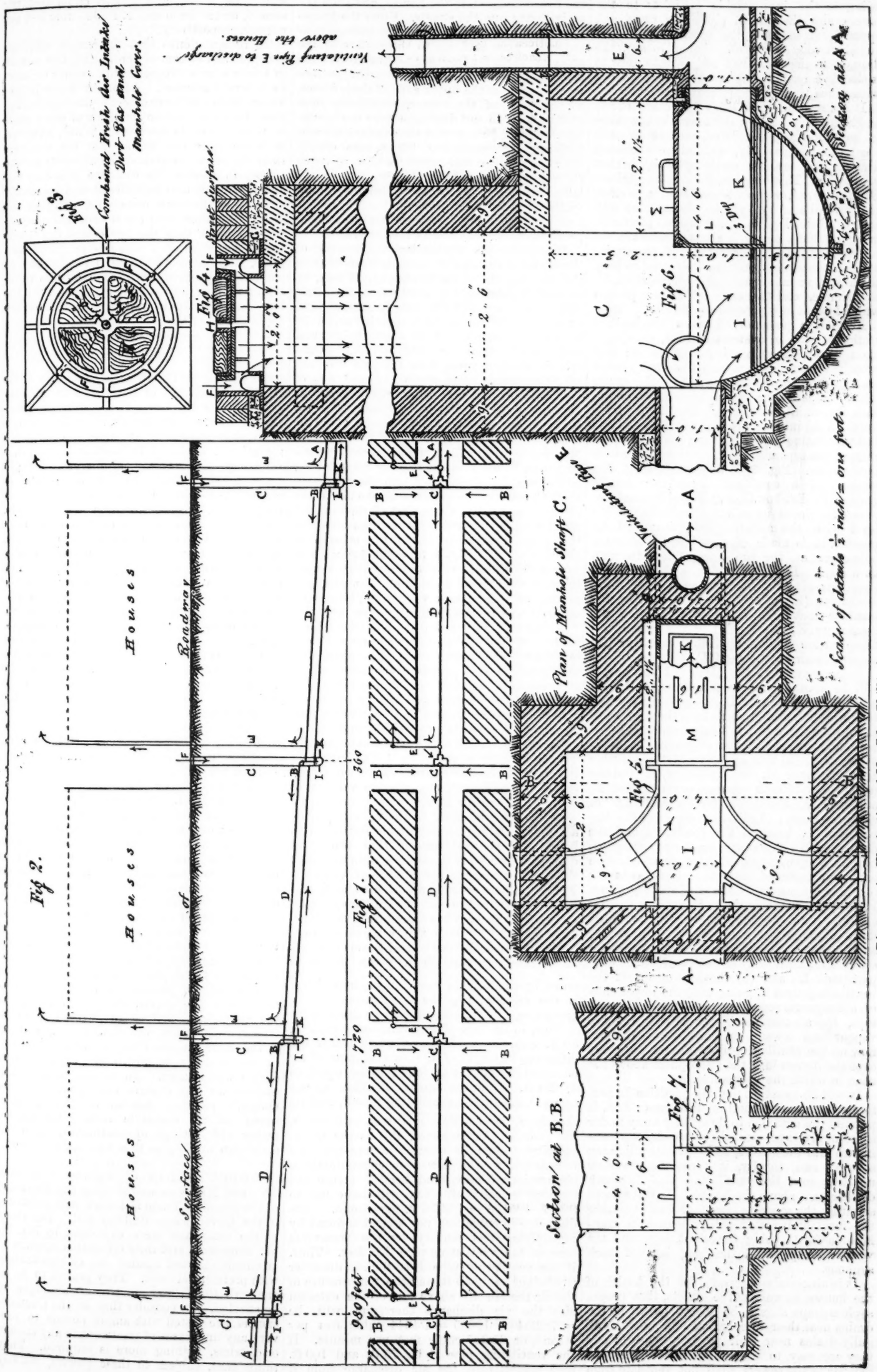
THE complete sanitary ventilation of sewers has never yet been properly accomplished. To discharge the sewer-air, charged with noxious gases constantly emanating from the sewage, up into the streets amidst the houses, and so to pollute the air which the people continually breathe, is neither sane nor sanitary. Yet this method of ventilation is that which has hitherto been, and is still pursued. This baneful system is stoutly defended by the statement that sewer-air is so largely diluted with fresh air, which descends into the sewers, as to be not only comparatively pure when it is discharged into the streets, but is so insignificant in volume there, compared with the large body of the atmosphere by which it is again diluted, as to be perfectly harmless when breathed. This lame argument has prevented, and still prevents, the application of proper improvements for ventilating the sewers. The truth, however, is that the sewer-air discharged into the streets is never so uniformly mixed with the atmosphere there, before it is breathed, as is supposed; for when it is breathed by those who reside in the houses, or pass along the streets at or near where it pours through the gratings, and where its full strength and flavour are almost undiluted, it is absolutely injurious to health; and no doubt the inhalation of disease germs from this source has caused very many deaths. It is to remedy this insanitary system that the simple and efficient method of ventilation presently to be described has been devised.

All the sewers in towns are now formed in connexion with each other, and have manhole-shafts at their junctions, at intervals between the junctions, and at their upper ends; with open gratings bedded upon the shafts level with the streets. Owing to the sewer-air being always many degrees higher in temperature, and consequently lighter in weight, than that of the atmosphere,—which high temperature and lightness are caused by the hot liquids which are discharged down the drains from kitchens, sculleries, washhouses, baths, lavatories, and factories,—it freely flows or gravitates upwards, (1) from the lower to the higher ends of separate sewers; (2) from one sewer into another; (3) from the sewers in the lowest parts of a town to those in the highest parts; and (4) to the upper parts of all shafts, drains, and pipes connected with the sewers. From all these connexions (when the upper parts are unsealed by flaps or water-traps) the sewer-air, highly charged as it is with noxious gases, escapes into the streets and houses with a celerity proportional to the excess of its temperature above that of the atmosphere.

The gases exhaled from the sewage are carbonic acid, ammonia (which is a compound of nitrogen and hydrogen), and sulphuretted hydrogen. The proportional weight of the former gas to common air is as 3 to 2, and of the two latter gases as 3 to 5, and 7 to 100, respectively. The former, therefore, is very inert, while the two latter are very volatile. The warm sewage also exhales aqueous vapour in large quantities. The proportional weight of this vapour to common air is nearly as 5 to 8. Owing, therefore, to the extreme lightness of the ammonia, the hydrogen, and the aqueous vapour, these, the moment they are produced, fly upwards to the highest points in the sewers, and also in the drains and pipes connected with them. If, therefore, these points be open or untrapped, the gases and vapour escape therefrom into the atmosphere wherever the openings happen to be, whether in the houses, the streets, or above the houses. It will now be readily perceived that the gases and vapour are for ever striving, of their own accord, to fly upwards above the houses, and they would go there if we would let them do so. Why, therefore, do we not let them go there? Why do we persist in discharging them into the streets, and so poison the air we breathe?

The sewer-air which flows into the bottom of manhole-shafts from lower or outfall sewers has a natural tendency, owing to its lightness and elasticity on the one hand, and to the superior density or pressure of the atmosphere in and over the shafts on the other, to leap across the bottom of the shafts into and up the sewer or sewers entering there, rather than diverge and pass up the shafts into the streets. Engineers have been advised by "authority" to prevent the sewer-air from flowing up the sewers from lower to higher levels, and from one sewer into another, by placing self-acting flaps on the outlets of the sewers in the manhole-shafts. By this "suggestion" the sewer-air would be diverted up the shafts into the streets, provided the flaps closed tight against their seats, but *then* no sewage could possibly pass out of the sewers. As, however, sewage is produced and passes into the sewers more or less continuously, the flaps, if closed, would be forced open from their seats by its pressure acting behind them, and then the open spaces under and at the sides of the flaps would permit the sewer-air to flow across the shafts into and up the sewers discharging there, just the same as if no flaps were there at all. Hence these flaps, for such a purpose, are useless, and a failure and waste of money wherever they have been used.

Again, it has often been attempted to ventilate sewers in towns by connecting them with tall chimney-shafts placed above ground, with coal or coke furnaces always burning at the bottom causing powerful draughts up them. It was supposed that the strong draughts thus produced in the shafts would draw the noxious sewer-air from all the sewers, as well as from all the house drains, into the shafts, and so thoroughly ventilate the sewers and the drains. This expedient, if successful, would have been a most excellent and commendable sanitary improvement in connexion with the drainage of towns. But it was always found that,



Diagrams in Illustration of Mr. John Phillips's Article on The Ventilation of Sewers.

owing to the innumerable air-inlets to the sewers and the drains, producing cross and opposing air-currents, the ventilating effect of any shaft was only local,—that is to say, the draught in the shaft had no power to draw to it the air-current in any sewer beyond the one with which it was directly connected.

It has resulted from these and other efforts and suggestions, that if the sewers of towns are to be thoroughly ventilated, each sewer must be treated separately, and where necessary divided into separate sections, for its perfect ventilation. This being so, the question arises: Can each sewer, or separate sections of it, be effectually ventilated by a simple, costless, and self-acting process? The writer has no hesitation in saying that a power is always present in the sewers of towns which would, if practically utilised, thoroughly ventilate them, and so keep them free from sewage-gas accumulation, by the simple, costless, and self-acting process which he will now proceed to describe.

Fig. 1 is a plan, and fig. 2 a longitudinal section of part of a street or road, showing a main sewer (A A) running beneath it; and branch sewers (B) entering the main sewer (A A) from lateral streets; manhole shafts (C) at the junctions of the branch sewers (B) with the main sewer (A A), dividing the main sewer (A A) into separate sewer sections (D); and ventilating pipes (E) going from the upper ends of the separate sewer sections (D) above the houses. Fig. 3 is a plan, and fig. 4 a section, of a combined fresh-air intake grating F, dirt-box G, and movable manhole-cover H, placed upon the manhole-shaft (C) level with the street. This combined arrangement is made of cast iron: the manhole-cover at the top being filled in with hard wood. Fig. 5 is a plan, and figs. 6 and 7 sections, of a cast-iron sewage receiver (I), and discharger (K), placed at the bottom of the manhole-shaft (C). The receiver (I), and the discharger (K), are divided in the centre by a dip-partition (L), and upon the discharger (K) a movable air-tight cover (M) is placed.

Referring now to the plans and sections, it will be seen (1) that from the outlet of each upward sewer section D, the sewage falls into the receiver I, and proceeds from the discharger K into the head of the next downward sewer section D, without its flow or gravitation being obstructed; (2) that by means of the movable air-tight cover M, the discharger K, and the upper part of each separate sewer section D, are readily accessible for examining or cleansing them; (3) that by means of the dip-partition L, between the receiver I and the discharger K, any sewer, or the sewers generally in a town, may be divided for ventilation into any number of separate sections, as at D; (4) that by means of the air-intake gratings F, upon the manhole-shafts C, copious streams of fresh air continually flow from the streets down through the gratings into the shafts, and thence into and up the separate sewer sections D, until they are stopped by the dip-partitions L; and (5) that by means of the ventilating-pipes E, going from the upper ends of the separate sewer sections D to the house-tops, the air-currents in the sewers, with the vapour and sewage gas engendered therein, flow up the ventilating-pipes E, and discharge over the houses into the atmosphere above the zone in which the people live.

It will be seen that the dip-partition L, performs three most important functions: first, it permits the drainage to flow freely away under it; secondly, it prevents the sewer-air from passing up into the streets, and also into adjoining sewers; and, thirdly, it turns the sewer-air upwards into the ventilating pipe E, which discharges it above the houses. It will also be seen that the separate sewer sections D assume the form of inverted air-syphons,—the manhole shafts C being the short legs, and the ventilating pipes E the long legs of such syphons.

It is absolutely necessary, for the health of the houses as well as the streets, that proper syphon-traps should be placed on all house-drains near their discharging ends, and on all gully-drains near their receiving ends (where they are easy to be got at), in order that the foul air in the sewers shall not ventilate from the house-drains into the houses, and from the gully-drains into the streets. From the house-side of the syphon-traps on the house-drains air-shafts now lead up to the surface of the areas or yards for fresh air to flow down them into and up the drains which discharge into them; and from the upper ends of these drains, at the back of the houses, ventilating-pipes now lead up to and discharge over the house-tops. It will be observed that the system now proposed for ventilating the sewers closely approximates to that which is now in vogue for ventilating the house-drains; and as the latter is so eminently successful the former would be so too were the several arrangements and appliances now proposed for effecting it provided in connexion with the sewers.

The power for ventilating the sewers, or the separate sections of them, is derived from the hot liquids before mentioned. These, by constantly entering the sewers from the house and other drains, and continually warming and expanding the air therein, thereby make its temperature higher, and its weight lighter and more elastic, than the external air. Atmospheric air and gases, from 32° and upwards of Fahrenheit's thermometer, expand $\frac{1}{490}$ of their volume for each degree that their temperature is raised. Hence it follows that 1,000 cubic inches of air at 32° expand $(\frac{1000}{490}) = 2{\cdot}0408$ cubic inches for each additional degree of temperature. When, therefore, any ventilating-pipe E, fig. 2, is carried, say 50 ft., above any sewer D, discharging into the manhole-shaft C, and the temperature of the air in the sewer D is, say 10°, above that of the external air, the height to which the column of air in the pipe E expands above the column of exterior air is $= \frac{10}{490} \times 50 = {\cdot}020408 \times 50 = 1{\cdot}0204$ ft. It is this difference in height between the two columns of air that produces motion, or spontaneous ventilation, along any sewer D, and up the ventilating-pipe E.

About 100 years ago Joseph Michel Montgolfier, of Videlon-les-Annonais, near Lyons, in France, who invented the air-balloon and the hydraulic ram, proposed the most simple and accurate method of determining the velocity of the warmer and lighter column of air in any sewer D, and the ventilating-pipe E, as pressed upwards by the colder and heavier column of air in and over any manhole shaft, C. This consists in ascertaining (1) the difference in height of the two columns of air when they are of equal weight, and (2) the velocity of efflux up any sewer D, and up any ventilating pipe E, which is equal to the velocity a body acquires in falling through this difference in height. It is well known that the space described by a body descending from rest near the earth's surface in the latitude of London is 16·1 ft. in one second, and the velocity the body acquires at the end of that time is equal to twice the space it has described in that time, namely, 32·2 ft. From this relation of space to time the velocity per second a body acquires in descending through a given height is found by the formula $v = \sqrt{2\,g\,s}$, in which v is the velocity, $r\ g$ the acceleration due to gravity = 32·2 ft., and s the space described.

Now, in the case of any ventilating pipe E, 50 ft. high, the space described (which is the difference in height of the two columns of air of equal weight) was found to be equal to 1·0204 ft. Then the velocity of efflux up any sewer D, and up any ventilating pipe E, leading therefrom, is $= \sqrt{64{\cdot}4 \times 1{\cdot}0204} = 8{\cdot}106$ ft. per second. As, however, this is the initial velocity, it must be reduced say one-tenth for retardation to the flow from contaminations, obstructions, friction, and bends. Hence the reduced velocity of efflux will be equal to $8{\cdot}106 - {\cdot}8106 = 7{\cdot}2954$ ft. per second. The discharge in cubic feet per second is found by multiplying this velocity by the transverse area of the ventilating pipe E in feet. Thus, if the ventilating pipe E be 6 in. in diameter (its height being 50 ft. and the temperature of the air therein 10° above that of the external air) the air discharge therefrom will be $= 7{\cdot}2954 \times {\cdot}19635 = 1{\cdot}4344$ cubic feet per second, or 85·947 cubic feet per minute. If the ventilating pipe E be 75 ft. and 100 ft. high respectively, the air discharge from it would be 2·1486 and 2·8648 cubic feet per second, or 128·9205 and 171·894 cubic feet per minute, respectively.

There is no doubt that the simple, efficient, and practical system of ventilating the sewers in towns as now proposed will, sooner or later, be generally adopted. At present a few house-owners here and there object to the ventilating-pipes being carried up the flank or other walls of their houses to the roofs. When, however, it is generally understood that the drainage from the houses originates the necessity for the sewers to receive this drainage it is only fair and reasonable that facilities should be readily afforded by the house-owners for carrying the ventilating-pipes from the sewers to the house-tops, in order that the houses and the streets should be unpolluted with sewage vapour and gases, and kept as sweet and healthy as possible. Wherever permission for this ventilating pipe is stubbornly withheld, then the law should make it compulsory, because the appliance is for the public benefit.

NOTES.

MR. PENROSE'S demonstration at the Institute of Architects on Monday of the result of his recent explorations on the sight of the Temple of Jupiter Olympius, at Athens, of which a *resumé* will be found in another column, is, if we accept the accuracy of the facts brought forward (and which we see no reason to question), conclusive in favour of the view propounded, that the temple was octastyle. The ground-plan itself is evidently and most unquestionably that of an octastyle temple, and the discovery of the foundations of a peribolos wall practically equidistant from each flank of the temple, together with the absence of any indications of footings in connexion with the temple and outside of the line of the octastyle building, seems to preclude the idea of a decastyle temple commenced and afterwards reduced to an octastyle for the sake of economy. It must be admitted that the literary evidence in favour of the decastyle character of the temple seemed very decided, as well as the architectural conclusions as to the abnormal proportion in height and width of the naos, which the octastyle theory renders inevitable; and the vexed passage in Vitruvius might have fitted one theory or the other according as it was manipulated. We have now, however, no more to do with considerations about various readings; our veteran Hellenist has dug up the real evidence for us from the site of the building, and it now only seems odd that for so many generations architects and writers on architecture should have disputed as to a point of which the evidence was on or at least immediately under the ground, if they had looked for it. The high narrow proportions of the internal naos, which we are now obliged to accept as fact, certainly do not commend themselves to our general idea of architectural effect or of the practice of the Greek architects; but the result, after all, leads us to the conclusion that as in Mediæval, so in Greek, architecture, the more we learn about it the more we are likely to find of variety in the manner in which the same type of design was treated. In connexion with the subject we may observe that Quatremère de Quincy's restored interior of the Temple, based on the decastyle idea, does appear rather wide, though unquestionably the octastyle plan would give it as unusually narrow.

A DEPUTATION of Railway Chairmen and Managers waited upon the President of the Board of Trade last week with reference to the Government Railway Bill. The views of the companies were explained by Mr. M. W. Thompson, and their opposition appears to be chiefly directed against the clauses dealing with preferential rates. They profess to be at one with the Government as to the object to be effected, but consider that if the Commissioners are vested with ample powers to prevent any unfairness of treatment to any traders or districts, nothing more is required. They think that, subject to these powers, railway

companies should not be prevented from modifying their charges to meet the varying circumstances under which traffic is handed to them for conveyance. Their contention is that inequality of charge should not of itself constitute unfairness where the conditions of trade are dissimilar, and where no competitive interests are involved. The companies seem to have a fatherly concern for the prosperity of shipping ports, for when they get to this point they always argue that the prohibition of lower rates for imported than for local traffic would seriously affect the trade of the ports. But although no one would wish the low rates (which, we are bound to assume, are remunerative) to be withdrawn, it is certain that they must not be maintained at the expense of local traffic; and we shall be much surprised if the House of Commons leaves this point for the Commissioners or any one else to decide. The feeling of the country clearly is that this Bill must decide it. A step in the right direction has recently been made by the reduction of some of the local rates from Liverpool to London to the figures formerly applied to import traffic only. The railway companies are now quite reconciled to the Government proposals as to re-classification, and Sir Michael Hicks Beach promised to give careful attention to their representations upon other parts of the Bill. Sir E. Birkbeck's Fish Rates Bill was also discussed, and this measure, which was strongly condemned by Mr. Thompson as unjust in principle, received but little encouragement from the President of the Board of Trade. We thought from the remarks made by the hon. baronet before its introduction that rather too much was aimed at in this measure,* and it appears probable that it will be dropped and an attempt made to attain its object in Committee upon the Government Bill.

THE Surveyors' Institution is to be congratulated on the fact that nearly eighty candidates have presented themselves for the Examinations being held by that body this week. So great a number of candidates could not be examined with convenience at the Institution's own premises, so one of the large Examination rooms in the Surgeons' and Physicians' Hall on the Victoria Embankment has been kindly lent for the purpose. The candidates include seventeen building and quantity surveyors, thirty-two valuers (London), and twenty-three land agents. There is a staff of thirty-six examiners (including the most eminent members of the various branches of the profession, and five Queen's Counsel). The examination began on Monday with out-door work at Osterley Park, where upwards of seventy of the candidates were hospitably entertained by Lord Jersey. We have not space this week to mention in detail the programme of the examination, but hope to return to the subject. The results of the examination will not be known for a month, but that such a large number of candidates should present themselves at one time is a significant commentary on the presumptuous efforts lately made by self-constituted "registrationists."

WE hear that the rebuilding of the University College of Wales, at Aberystwith, is now approaching completion. As our readers will remember, it was originally commenced as an immense hotel from designs by Mr. J. P. Seddon, but was never completed for that purpose, and the portion built was purchased for a University College, and burned two years since, just as the college authorities were deliberating whether to enlarge the old building or to acquire a new site. The partial destruction of the building by fire has now permitted of the remodelling of the interior arrangements, while the substantial character of the exterior walling, having survived that disaster, has enabled the architectural style in which it was first erected to be preserved. A number of small rooms have been converted into large class-rooms and college halls. The building now has a frontage of some 450 ft., and consists of a central block used as the principal's residence, and a wing to the north for the Arts department, and one to the south for that of Science. The Arts wing is entered by the peculiar and, perhaps, unique triangular stone porch, with the grand staircase adjoining in the lower part of a tower; opposite which is a museum hall of oval shape, 48 ft. long by 24 ft. wide. A curved entrance corridor leads by this to a central hall nearly 100 ft. long by 24 ft. wide, top lighted, right and left of which open large class-rooms, each with its professor's private room attached to it, and at its further end is a college-hall, about 80 ft. long by 40 ft. wide and 25 ft. high, having a series of bay-windows on the sea front and an arcade with columns with marble shafts and carved capitals on one side with vaulted recesses beyond. Several staircases lead from the central hall to a corbelled gallery carried all round it and leading to another range of class-rooms above. The library, 75 ft. long by 40 ft. wide, and connected with a reading-room, 27 ft. square, by a large archway, is over the college-hall on the first floor, and an oval council-room over that of the museum. The Science wing is in two divisions on the ground-floor, for the physical and biological departments, each having its lecture-room and laboratory, and private laboratory, &c.; and the floor above for the Chemical department, with a large lecture-room capable of holding 100 persons, chemical laboratory 60 ft. long, private laboratory, balance, and store rooms, &c. Mr. J. C. Carter is associated with the original architect, Mr. Seddon, in carrying out the new work.

* See "Notes," Jan. 28, 1888.

A CORRESPONDENT writes from Rome:—"The crisis which has prevailed in the Italian building trade during the winter has now entered upon a new stage. It had been hoped that the 43 million lire which the Government advanced certain banks two months ago, with a view to assist building contractors and investors, would have sufficed to avert any acute crisis, but it is now discovered that the sum is like a drop in the ocean. Consequently, one great firm has been compelled to suspend payment, their liabilities amounting to some 52 million lire, exclusive of mortgages. This failure is not only of financial importance, but may have serious economical consequences, as the firm employs over 2,000 masons and artisans, in addition to having large quarries, brickworks, and lime-kilns in the country. It is expected that some 5,000 men, with families dependent upon them, will be thrown out of employment. In addition, through this failure, the Esquilino Company has also been compelled to suspend payment, and cease work on eighty large buildings which they have in hand. This will cause some few thousand more men to be thrown out of employment, and further intensify the crisis. Probably the Government will come to the rescue of the distressed *entrepreneurs*."

THE Oaks Estate, in Surrey, will shortly be put up for sale by auction. The park, of about 180 acres, is situated by Banstead Downs, between Cheam Valley and Woodcote, two miles southwards of Sutton railway station, and four miles to the east of Epsom. Two of our chief racing stakes take their titles from this property and its quondam owner, Edward, twelfth Earl of Derby. In May, 1779, he established the Oaks Stakes, which he won with Bridget; and in the year following he founded the Derby. Here, in Woodmansterne parish, originally stood an inn, by sign of "Lambert's Oak," which was rebuilt for the use of the Hunters' Club. Having been occupied in turn by a Mr. Simmons and Sir Thomas Gosling, it passed to Lieutenant-General Burgoyne, who built, and furnished in plain fox-hunting style, the large dining-room. The fee-simple was next acquired by Lord Derby, who added to the house its two wings, of red brick, in the castellated style, and with four angle-towers apiece. Here he kept his pack of staghounds, and here, in honour of his marriage (June 23, 1774) with his first wife, Elizabeth, only daughter to James, sixth Duke of Hamilton and Brandon, had been held the garden *fête* which General Burgoyne commemorated in his operetta, "The Maid of the Oak." Nearer to Epsom stands Durdans, associated in our time with Lord Rosebery's former racing stud. Durdans,—since rebuilt, in 1764, by Mr. Dalbiac,—was erected by George, fourteenth Lord Berkeley (advanced Earl on September 11, 1679), with the materials of Nonsuch. That palace, of whose beautiful gardens Hentzner gives us a glowing description, was begun by Henry VIII., at the dismantled village of Cuddington. Having been occupied by Queens Elizabeth, Anne of Denmark, and Henrietta Maria, the mansion was valued at 7,020*l.* by a Parliamentary survey of 1650. Charles II. granted it to Barbara, Duchess of Cleveland and Baroness Nonsuch. She pulled it down, sold the stones, and disparked the grounds. Portion of the latter is now represented by Worcester Park, between Cheam and Ewell.

AT the exhibition of the Society of Painters in Water-Colours most of the leading members are represented. Mr. Alma Tadema exhibits a drawing,—not a very usual occurrence in this gallery of late,—nor is this drawing, "Midday Slumbers" (224), much more than a sketch, in comparison with his usual high finish, but it adds a value to the collection. Mrs. Allingham has only one work, "Confidences" (4), rather larger than usual, where two country girls talk over a wall in front of a mass of foliage; the face of the nearer figure seems a little too mechanically painted up, in comparison with the broad though delicate style of the artist's best work; nor is there so much of interest and expression in the figures as she has often given us. One of the gems of the collection is Mr. North's "Sir Bevis and the Wood-woman,—in Memory of Richard Jefferies" (131); we presume the reference is to an incident in Jefferies's writings which we have forgotten, but the small figures are only incidents in an exquisitely-delicate landscape, painted with an evident love and passion for nature which renders it a fitting tribute to the writer it commemorates. Of course, Mr. North's style is artificial in a sense; but it is artifice of the most poetic kind. Mr. A. Hunt sends three works, the principal of which is "A Wind of the Eastern Sea" (36), looking down from Whitby on the sea; an attempt to get rid of pigment, and give air, and moisture, and breeze: not to be looked at too close; give it a due distance, and you see the sea glimmering and undulating under the wind, though there is no absolute or realistic drawing of the crests of waves. Mr. Tom Lloyd's "Ferry-boat, ahoy!" (25) is a picture like a kind of more etherealised Frederick Walker; the bank of a river, with figures disposed along it, beautifully grouped in front of a rising moon; the figure of the girl reclining on the left, rustic as she is, is full of classic grace; though these are hardly real peasants; like Mr. North's landscape, they are transfigured. In "Memories of Old Songs" (39), Mr. A. H. Marsh has succeeded in realising a face and figure of more genuine pathos and feeling than is often seen on an exhibition wall. Two or three well-known artists are experimenting in regions outside their usual practice; Mr. F. Powell in a glowing sunset landscape (22), Mr. Walter Crane in a small landscape (23), Mr. Henry Moore in an inland landscape also (33). "The Needles" (7), by the latter artist, is an exquisite little work, quite magical in its effect of air and sunlight. Mr. Herbert Marshall has a view in "Little Britain" (6), with St. Paul's silhouetted in mist behind, and a view of "Mervagissey" (61; so printed in the catalogue; surely wrong). He sends also a very large drawing "From Waterloo Bridge, looking East" (94), not quite so real in effect as some others. Local colour seems lost in panorama. "A Towing-path Bank" (60), by Mr. Walter Field, is a wonderfully real bit of study of a Thames bank. Drawings in which streets and buildings form the main subject are numerous, and many of them admirable. Among them, "A Street in St. Ives" (71), by Mr. Waterlow; "St. Riquier, Picardy" (115), by Mr. Murray; "Maidstone" (127), and one

or two other delicate topographical drawings by Mr. A. Goodwin, and Mr. Boyce's beautiful little work, "The Church at Llantwitt-Major, South Wales" (222), which every architect should look at. Mr. Goodwin's "Lincoln" (143), is a repetition of his "Cities of the Plain" effect of last year, and looks over-wrought for a representation of a real city, even though it be one from which the devil was said to look. Mr. Goodwin's large work is the island of the "Tempest" (70), with Prince Ferdinand seated on rocks over a transparent pool and hearing the song of Ariel; pelicans stand solemnly on the rocks and butterflies disport in the foreground; the scene has the same mystical tone as other "enchanted" scenes to which the artist has taken us. In "A Quiet Evening" and "On the Devon Coast" (147, 187) Mr. Gregory has realised a wonderful effect of sunlight, which should not be passed over. One of the finest landscapes in the room, though not a large one, is Mr. Eyre Walker's "A Cloud over the Sea" (207), really a grand work in its spaciousness of effect. Near it is a fine study by Miss Edith Martineau (216) of a noble-looking young girl playing a violoncello; one of the best pieces of figure painting in the room; "Two and One" is another fine work by the same artist. Among other figure subjects, Mr. Walter Duncan's from the "Arabian Nights" (175) is remarkable for the human expression in the ape who had been transformed from a man. Mr. Walter Crane has a rather remarkable decorative work entitled "Sunrise" (178), the motive of which, however, is not very plain. It is disagreeable to find absolute disappointment in the work of a recently-elected member, but it must be plainly said that Mr. Henshall's four-part picture "Married" (211) is a piece of vulgarity which is utterly out of place in an exhibition of this Society. If work of this stamp is to be admitted, the Society cannot expect to keep its high position.

AN old and respected lover of Gothic architecture has left us. Mr. M. H. Bloxam, as recorded in another column, is just dead, in his eighty-fourth year. He was one of the first enthusiastic supporters of the Mediæval movement in modern architecture, which he saw flourish and decay, while he himself outlived it. But, as an amateur, he had the merit of having produced, in the quite early days of the movement, a popular text-book of Gothic architecture, which was one of the best books of the class that has been produced, and which has gone through a number of editions, and even survived the architectural movement which called it forth.

THE exhibition of the Institute of Painters in Water Colours is one of the best which has been held in the present rooms. The collection is still too large, and contains a great deal that could well be spared, but there is a larger proportion of good work out of the whole than we have seen previously, and some of it is very good. Mr. Arthur Severn has produced a grand and impressive work in his "Mussell-gatherers hurrying from the Tide, Morecambe Bay" (89); the lurid sky is perhaps rather too heavy and solid in appearance; the figures are small, but, relieved against the sky on the dark outline of the middle-distance shore, they produce the intended effect in harmony with the whole feeling of the work. "Moonlight over Westminster" (915), by the same artist, is an exceptionally fine and real night effect, avoiding the stumbling-block of too much definition, which is the shipwreck of so many so-called "moonlight" scenes. Mr. Henry Stock's ideal and imaginative works are little suited to the prevailing tone of a miscellaneous exhibition; "The Dream" (260), two indistinctly-pictured faces, that of the dreamer and the vision, is very poetic; "Love and Duty" (265) hardly rises to the height of the poem, but it is truly pathetic; the artist has endeavoured to give the parting scene as one in everyday life, while avoiding the prosaic suggestion of too much realistic detail. His "Soul contemplating the Stars" (391) is a fine thing, the head of the "Soul" half-turned away, fine and rapt in expression, and the stars shine with a remarkable light; in the "Soul contemplating the Grass of the Field" (683), the female figure representing the Soul seems a little too realistic. Attempts such as these to convey high poetic thought in painting are always liable to a partial failure from the very conditions of the art; but what a fall there is from even the failure of such an attempt to the commonplace success of such a thing as "The Deck of a P. & O. Steamer" (231),—a successful representation, no doubt, of human life in about its most vulgar and uninteresting types. Among other figure pictures to be mentioned is Mr. Tenniel's clever and humorous illustration of a scene in "The Fortunes of Nigel" (9); Mr. Langley's "Village Idyll" (164), the old contrast between youth and age, well grouped and studied, and with much feeling and pathos in the head of the old woman in the foreground; "The Village Genius" (503), a small but admirably studied work by Mr. H. R. Steer. The same praise may apply to another small work by Mr. Gordon Browne, illustrating a scene from "Rip van Winkle" (356). "All is not Gold that Glitters" (579), by Mr. F. Dadd, is a masterly study of an interior with three figures, two highwaymen, whose takings are being tested for quality by an ancient man; there is real creation of character in these faces. Miss Beatrice Meyer's "Her Royal Highness's Birthday" (575), a picture with a crowd of small figures, does not represent the highest quality of art, but is very clever. Mr. C. Green has produced another admirable Dickens illustration in "Mr. Turveydrop's Dancing Academy" (565). Sir James Linton's two contributions, "Sacharissa" (23) and "Lady Peverell" (559), are exquisite paintings of costume, Titianesque in beauty of design and richness of colour, but the personages clothed are only finely-finished models with no special human character. Among the landscapes may be mentioned "Seal Rocks, San Francisco" (36), by Mr. MacWhirter; "Pendine, Carmarthen Bay" (39), by Mr. T. H. V. Fisher; "Weeding" (50), a little but very fine landscape by Mr. J. Knight, superior to his larger but more artificial painting "The Grey of the Morning" (141); "Christchurch" (137), by Mr. Halswelle, a thunder-and-lightning sort of effect, very stagey; "Moor at Inveroykel" (169), by Mr. Wimperis; "Kinharvey Moor" (193), by Mr. Orrock, who has a remarkable power of giving wet and wind in a landscape, still better illustrated in his "Solway Frith" (733), a large and noble work, and in his small view "On the Nith" (320), where the indication of a rainbow is really remarkable for aërial effect. Mr. East's "A Winter Solitude" (251) is a curious and expressive study of desolation, as we may call it, perhaps a little too large for the subject, but very original. "Bolton Abbey," by Mr. Bernard Evans; "Under a Welsh Crag" (484), a large powerful drawing by Mr. T. Collier; "Sea-fog and Sunshine" (487), a notable little work by Mr. East; "A Hayfield," by M. Aumonier, are amongst the most prominent landscapes. There are a number of small works which are very good, and which we have not space to particularise. Among architectural subjects may be mentioned Mr. Fulleylove's "Magdalen Tower and Bridge" (148); two very clear and bright sketches of bits of Melrose, by Mr. R. P. Spiers (150, 206); "Early Morning in an old Market Town" (407), by Mrs. Harry Hine; "Old Gateway, Sandwich" (468), by Mr. T. Pyne; and "St. Paul's from Ludgate-circus" (574), by Mr. Fulleylove.

THE point of the paper read by Mr. Lewis F. Day before the Society of Arts, on Tuesday, on "Craftsman and Manufacturer," was the now old charge against the middleman, between the craftsman and the purchaser, as being an influence alien to the development and encouragement of artistic work; but Mr. Day puts some things in a new manner. He says that the "enterprising tradesman" is not "enterprising" in the true sense; that he does not know what to do with the materials he gets hold of, and prevents the craftsman having a chance of doing it. When the manufacturer gets hold of a form of artistic design in any class of material, say Japanese or Persian, which is new to this country, his object is not to use it as a suggestion of new ideas for the craftsman to work out, but to create a new fashion for the imitation of it. He "works" it, and soon works it out. All the good that might be got from it is lost, and the mere novelty is worn out in two or three seasons, and he looks out for another novelty. This is the simple truth of the matter, no doubt: and hence it is that one hears *ad nauseam* from the manufacturer and his myrmidons the phrase "this is the newest thing," as if that were the only form of recommendation present to his mind. What is the remedy? We imagine the only effectual remedy is the one which Mr. Day suggests in one portion of his paper,—education of the purchaser. When manufacturers find that the purchaser no longer cares for a thing because it is "new," but wants design and invention, he will have to take the craftsman into his counsels and give him a direct voice in the matter. The absolute abolition of the middleman may be impossible; in the present crowded and hurried state of life, his emporium is perhaps a necessity. But he must be taught his right place.

THE TEMPLE OF JUPITER OLYMPIUS AT ATHENS.

ROYAL INSTITUTE OF BRITISH ARCHITECTS.

THE tenth Ordinary Meeting of this Institute for the present session was held on Monday evening last, Mr. A. W. Blomfield, A.R.A. (Vice-President) in the chair.

Mr. F. C. Penrose, M.A., read a paper entitled "The Temple of Jupiter Olympius at Athens, and some Recent Excavations on the Site," of which the following is an abstract:—

The author considered that no ruins of Classical antiquity were perhaps more impressive than the columns of the Temple of Jupiter Olympius; and that the group of thirteen at the south-east corner gave a suggestion of intricacy, while those near the western extremity evidenced about the original length. The temple had been completed just before the extinction of paganism, but had been in progress for about 650 years, reckoning from its first foundation by Pisistratus. Having read a short description of the temple by Pausanias, Mr. Penrose referred to a drawing by Carrey, the artist who accompanied the Marquis of Nointel, the French ambassador at Constantinople in 1674, which showed that a small church then existed among the group of thirteen columns, a portion of the campanile of which was still visible in 1848, but since taken down. Spon and Wheler, who had visited Athens about the same date, described the sixteen columns of the temple and the small church,—St. John of the Columns. Stuart mentioned a seventeenth column, which was shortly after taken down by a Turkish Governor for the sake of the material. In 1845–47, when the author was at Athens, sixteen still existed: the group of thirteen, and three isolated columns; the middle one of the latter, however, was blown down in 1852. The existing columns were remarkable both for their great size and extraordinary beauty. The character of the foliage on the capitals in the neighbouring Arch of Hadrian was much inferior, that on the capitals of the columns of the Temple being very fine and resembling in a marked degree the early Corinthian example of the Tholus at Epidaurus, about 410 B.C. Mr. Joseph Woods, speaking of the probable date of the ruins of the Temple, discussed three possible periods,—Antiochus, Augustus, and Hadrian,—and referred the date to the time of Augustus, several particulars rendering it probable that the work was earlier than Hadrian's time. Except for the assumed transportation to Rome of the columns erected under Antiochus, Mr. Woods himself was disposed to refer them to the time of that monarch; and with regard to the transportation, Mr. Woods remarked that there was no column, or portion of a column, of large diameter of Pentelic marble in Rome. The author was of opinion that the columns were of the time of Antiochus, arguing that a column built of a number of drums could not be taken

down and re-fixed without utterly spoiling the perfection of the joints, on which the ancients so prided themselves. Mr. Woods endorsed his opinion as to the beauty of the workmanship and the effect produced by the existing remains. Some of the dignity of the columns was due to the massiveness of the diameter compared with the height, which was about eight and a half times the diameter. Nothing now remained above ground, except the columns and their architrave, and the upper of the three steps of the stylobate, but underground were sufficient foundations to restore the general plan of the Temple, and a few fragments which would assist in a restoration of the superstructure. Previously to the most recent excavations it was generally accepted that the plan was decastyle, but all the beautiful and remarkable *à priori* arguments had been upset by the spade, and the temple proved to have been octastyle. The Society of Dilettanti, with a view to a new edition of the "Principles of Athenian Architecture," desired an examination of the Temple, and the author conducted some excavations which commenced in 1883, and were continued at intervals during the three succeeding years. The foundation at the north-east corner was entirely laid bare, and the excavation extended to some way beyond the north-western angle, a distance of 400 ft. Mr. Penrose proceeded to give a detailed description of the progress of the work, in the course of which he stated that the level of the pavement below the main stylobate showed that the temple had three steps of equal height. Sufficient evidence of these was obtained near the south-eastern angle, and some massive portions of the marble upper step (the two lower were of hard crystalline limestone) displaced, were found on the north side near the eighth column of the north row,—one of the confirmations of the octastyle arrangement. Near the fourth column was the foundation of a return wall carefully chased into that which had been laid for the peristyle. This seemed to favour the decastyle theory, but its duty was probably that of a ground buttress to stiffen the pronaos wall. Search was made for a possible ninth and tenth row of columns, but it was clear no preparation had been made for them. The foundations of the seventh row were found to a considerable extent. The foundations of the north cella wall were traced for about 80 ft., and a return wall which fell into it terminated in a door-jamb of the principal entrance to the naos. After describing other portions of the foundations discovered, and referring to the materials used and the dates of their construction, the author proceeded to deal with various other parts of the temple in considerable detail. Before concluding with a restoration of the Temple, he thought it might be worth while to consider whether a decastyle was first intended, and that reasons of economy had led to the adoption of the octastyle; and deduced reasons to show that this had not been the case. Mr. Penrose then described a restoration of the superstructure, based on the excavations, in plan and elevation, which was illustrated with diagrams.

The Chairman, in inviting discussion, said that while listening to Mr. Penrose, he could not help asking himself the question, whether the interest they were supposed to take in Greek work was as real and lively as it undoubtedly ought to be. They all professed to have the greatest admiration for Greek architecture, and he supposed they had studied it up to a certain point, or perhaps it would be more correct to say up to an uncertain point. But it was very much to be doubted whether many carried the study of it very far, and devoted sufficient time and attention to it to influence their practice of the art. However that might be, they were favoured that evening with the presence of a gentleman who was, without doubt, the greatest living authority on Greek architecture, and of another gentleman who was the greatest authority on Classical art. He need scarcely say that he alluded to Sir Frederick Leighton, from whom he hoped to hear some remarks (applause).

Mr. W. H. White (Secretary) then read a communication from Mr. Edward Falkener, in which he gave his reasons at some length for supposing that the Temple of Jupiter Olympius was decastyle.

Sir Frederick Leighton, Bart., P.R.A., said:—I never was so amazed as when I just now heard your worthy chairman inviting me to rise and deliver myself on the subject of the Temple of Jupiter Olympius at Athens, and if at this moment I am on my legs, it is not in order to speak on that subject, but simply to say that I come here in the more becoming spirit to listen and to learn. I have listened very attentively and respectfully, and I venture to hope that I have also learned something. I do not propose to add a tag of ignorance to a lecture which has shown so much labour. The passing years of my life have taught me a valuable lesson,—that is, the desirability of not speaking on subjects I do not understand. I saw the Temple of Jupiter Olympius some years ago. I admired the stately remains of the columns, and, as a painter, I admired the contour of the pillars and the beauty of the capitals; but that is about the whole intellectual stock I brought away with me from the visit. The only reflection I remember having made, and which I still hold and shall continue to hold, was that, in spite of the magnificence of the work and the proportion, in the extraordinary monotony of the planning out, this superb temple is infinitely inferior in every way to that supreme marvel of architecture the Parthenon, which towers above it. I would simply add that as a member of the Dilettante Society it is a matter of gratification that my name should be in any way connected with so distinguished a man as Mr. Penrose, whose fame reaches far beyond these islands, and of whom your profession is justly proud (applause).

Mr. George Aitchison, A.R.A., proposed a vote of thanks to Mr. Penrose for the very interesting paper they had listened to that evening. The question as to whether the Temple of Jupiter Olympius at Athens was an octastyle or a decastyle temple had vexed the learned world for the last 400 years, and had been a subject of controversy, which had been almost as bitter as some religious questions. About the year 1543, Philander, without assigning a reason, expunged the word "et" from the well-known lines of the *editio princeps* of Vitruvius, published in 1486:—"Exemplar Romæ non est sed Athenis octastylos et in templo olympio." Schneider, in 1807, restored the "et" in his critical edition. Vitruvius was a crabbed writer, and they need not have much misgiving in supposing that the "et" did not allude to another temple, but that he meant "there is no decastyle example at Rome, but there is an octastyle example at Athens, and that is the Olympian Temple." However, Mr. Penrose had now, he ventured to say, set the question at rest for ever (applause). Those who had been brought up in the belief that all the Greek temples were open would naturally feel that one of their strongholds had been stormed and taken now that this Temple of Jupiter Olympius was found to be an octastyle one. He scarcely ventured to set up his opinion against that of such a learned man as Mr. Falkener, but it certainly had occurred to him, when studying Vitruvius, that there were temples to five deities, which, Vitruvius said, "on account of things which are determined must have hypæthra,"—that is, be open to the sky or have an hypæthron. These five temples were dedicated to Jupiter, Lightning, Heaven, the Sun, and the Moon, and the reason giving was that "the appearance of these deities is seen in the open, shining face of nature." It was afterwards simply stated that decastyle temples must be left open in the middle, without stating why, looking very much as if it had been taken from the few examples that remained. The only example of a decastyle temple which remained, except the Heraion, at Samos, was the Temple of Apollo Didymaus, near Miletus. That was said by Strabo to be left unroofed because it was so large. It was destroyed by Xerxes, the result being that they never got the means for roofing the Temple. That temple, therefore, remained unfinished, as did the Temple of Jupiter Olympius, which the octastyle Vitruvius gives as the example of an hypæthral temple, from Sulla sacking the town and taking the internal columns, hence the Athenians never had sufficient money till Hadrian's time to finish it. But why it was supposed that the magnificent Hadrian should have reduced the size of it was unaccountable, as, according to Pausanias, he did not seem to be a man who had economic views. He would like to have Mr. Penrose's opinion as to the question of the lighting of the Temple. It appeared to him if the temples were lit, as had been hitherto supposed, by hypæthra, they would be inundated by the torrential rains, unless there was some provision for carrying off the water. In that case there ought to have been a drain right under the centre of the naos, whereas Mr. Penrose shows the drain outside the peristyle.

Mr. Arthur Cates remarked that the testimony of the pick and shovel was both positive and negative. Mr. Penrose had given positive testimony as to the foundations of the octastyle temple, but he did not gather that he had given any negative testimony by evidence of further investigations to the northward, to which Mr. Falkener had alluded, and which might possibly have produced some evidence with respect to other foundations, either for the earlier design of Cossutius or of some other work. The exceedingly able exposition Mr. Penrose had given had, he feared, dissipated the idea which many had cherished that the Temple of Jupiter Olympius was decastyle. Unless, therefore, some other explorer should find some better evidence, it seemed to him that Mr. Penrose's evidence was incontrovertible. One great matter of evidence was the position of the Temple with respect to the peribolus wall. If any one thing was necessary to convince the sceptic of the accuracy of Mr. Penrose's work, a consideration of the plan, assuming the peribolus to be of the time of Hadrian, would be sufficient to satisfy him that the Temple was of the dimensions and character he had indicated. They were much indebted to Mr. Penrose for the exposition he had given, and to the Dilettante Society for having encouraged him to proceed with those investigations, which were exceedingly important and valuable. It was, therefore with great satisfaction that he learned the work had been undertaken with a view to the production of a new edition of that excellent and admirable book, "The Principles of Athenian Architecture," which he hoped would be rendered more readily accessible than it had been, and would be studied by all the younger members of the profession. He seconded the vote of thanks, which was carried by acclamation.

Mr. Penrose, in his reply, said that Mr. Falkener would be answered in many respects when he read the full paper. Mr. Falkener imagined the width of the peribolus to be 463 ft., whereas it was only 424 ft., so that the argument he founded on that was not sound. He had made excavatione 18 ft. and 36 ft. north of the octastyle temple, but found the place of what would have been the N.E. column taken up by rough rock, and the base of the N.W. column occupied merely by some groundwork for the pavement, while the intermediate part where the ninth row would have been was occupied by the progression of the drain. He might say that he had never doubted the supremacy of the Parthenon. Mr. Aitchison had referred to the lighting of the temple. Torrents of rain frequently fell at Athens, so much so that the whole ground swam; and unless the objects in the naos, and especially the cryselephantine statue, were specially protected by the roof, the rain could not have been endured. Fergusson's theory, however, entirely provided for that. There would be stairs of some kind, and a narrow staircase could be carried up, so that a person could ascend into the galleries and close the curtains. He would say to Mr. Cates that the foundations were looked for north of the octastyle row, but not found. The reason for Cossutius departing from the lines of Pisistratus and changing the axis for more than two degrees was for the purpose of the Temple being made as correctly east and west as was possible. To such a degree of accuracy had this been done that it did not differ from the true east and west by more than three minutes of a degree, as was shown by careful astronomical research.

The meeting was then adjourned to Monday, the 7th prox.

Chelsea Public Libraries (Kensal Town Branch).—We are informed that the award in the architectural competition for the erection of the above building has been made, and the first premium given to Messrs. Karslake & Mortimer, of 5, Great Queen-street, Westminster, the second premium being given to Mr. F. W. Hamilton, of Victoria-chambers, Victoria-street, S.W. Mr. J. M. Brydon, architect, was the professional assessor. There were twenty-three sets of designs sent in.

GREEK MOULDINGS.

THE ARCHITECTURAL ASSOCIATION.

THE twelfth ordinary meeting of this Association for the present session was held on the 20th instant, at 9, Conduit-street, Mr. John Slater, B.A. (President), in the chair.

The following new members were elected, viz., Messrs. H. M. Mavor, E. J. J. Alnutt, and W. R. Phillips.

Officers for the ensuing session were nominated, including Mr. H. D. Appleton as President, and Messrs. Leonard Stokes and W. Burrell as Vice-Presidents.

Votes of thanks were passed to Mr. Taylor Smith and Messrs. Davis and Emmanuel in connexion with the late visit to Cutlers' Hall, and to Mr. Walter Emden for permitting the members to inspect the Court Theatre.

Mr. F. R. Farrow then delivered a lecture on "Greek Mouldings." He began by saying that there had been complaints made that some of the papers read before the Association were too elaborate for the younger members, and he had therefore decided simply to talk that evening on the subject he had chosen. By means of mouldings the architect emphasised the lines of his building, and also utilised them for attaining a certain amount of light and shade, both by the contrast which they presented to the plain surface of the building, and by the variation of the light and shade of the mouldings themselves. It had occurred to him that it would be very interesting and useful to the younger members of the Association, if they looked at the way in which the Greeks used their mouldings, and for several reasons; first of all, because Greek mouldings were for the most part of large size and simple in their contours, so that one could readily see the principles which had been at work in the minds of the architects who made them. Then again, the Greeks were a people of the very highest refinement in matters of art, as especially exemplified in the art of Athens. In the works of the Greeks great refinement was to be found, whilst science, art, and logic or reason were all combined in their proper proportions to produce works which had been the admiration of all ages. They would see what were the true principles of architecture and how they ought to be guided when they came to the works themselves. In addition to these points, there were also the very great advantages which the Greeks possessed in the matters of climate and material. The climate of Greece, with its beautiful atmosphere, gave the Greeks an opportunity of dealing with and entering into refinements which would be utterly lost in this climate. Therefore, if he asked his hearers to study the principle of Greek mouldings, he did not at all mean them to design buildings with those mouldings; because if they studied Greek mouldings properly they would see that they were totally unsuited to the English climate without a considerable amount of modification. Then, again, they had not the materials, the beautiful Pentelican or Parian marble, which the Greeks used, so that when they came to translate Greek mouldings into red brick, they would find they looked utterly incongruous and meaningless, with none of the light and shade which the Greek work had. Perhaps some of his hearers had already centred their love upon Gothic work, but whether that was so or not they would still learn from the study of Greek mouldings much of the principles which guided the Gothic men in the architecture of their period. After studying Greek mouldings for a time, they would appreciate far more than they did before wherein lay the beauty of the Gothic mouldings themselves. They would see those beauties which they had not before realised, and which would present themselves to the student. The first and most obvious Greek moulding to study would be the Doric capital, the origin of which was certainly somewhat indefinite. On referring to the text-books they would find examples given of Egyptian work, and theories had been started conveying the idea that from Egypt the Greeks derived the principle of the Doric column. Certainly this much was found in Egypt, namely, a small flat abacus and a many-sided column. So that there was all that was necessary for the Doric column except the capital. Nowhere in Egypt would they find the beautiful member of the Doric capital called the echinus on the part which was united to the column, so that it might be imagined that the Greek architects originally saw in Egypt the simple flat abacus upon a many-sided column, and, of course, were dissatisfied with the crudeness of it. They saw at once that it needed some sort of connecting-link between the square abacus and the vertical column. What they first used was possibly a crude ovolo; but that was very doubtful, because there were no remains of the oldest Greek works to show this,—the majority of the temples remaining to the present day dating after the time of the Persian war. He would suggest that probably the first thing that occurred to anybody for connecting the vertical lines with the horizontal would be putting a circular member underneath, which would be a first approach towards the Doric capital. There were no examples left to show this, but what they really found connecting the abacus was two curves. The primary feature of the Greek Doric capital was two curves, one convex and the other concave, leading from the square abacus to the circular column. In the examples remaining to the present day these curves were of the parabolic or hyperbolic form, and as he would have to refer constantly to the conic sections he thought it might be advisable that he should first of all explain what was meant by them, and just give one or two of the principles which immediately concerned the subject of Greek mouldings. He was assuming that he was speaking to the youngest men in the room, and those who were thoroughly well acquainted with the nature of conic sections would therefore kindly bear with him for a time. Mr. Farrow then explained the theory of conic sections, and the curves produced by the intersection of the cone by planes varying in direction, viz., the ellipse, parabola, and hyperbola. The next matter was the properties possessed by these, and which were useful to the Greek architects. A conic section might be defined as being the locus of a point which moved so that its distance from the fixed point was always in a given ratio from its distance from a fixed straight line. If the distance from the point to the curve was equal to the distance from the curve to the line, the curve was a parabola; if the distance was less from the point to the curve than from the curve to the line, the curve was an ellipse; while if the distance was greater from the point to the curve than from the curve to the line, the curve was a hyperbola. In Greece, with its bright atmosphere, the shadow on the curved surface of the earliest form of the Doric capital diminished too rapidly for the Greek architects' taste, so that they decided to have another curve. They first used the curve called the parabola where the distance from the focus and from the line was equal in every case. Mr. Farrow here showed the way in which the Greek architects probably drew their curves, which he said could easily be done by any working mason. The Greeks soon got to use the parabola, and in the best period of art they took to the hyperbola, for the reason that they hated nothing more than having two things that were exactly equal to one another. In the parabola, all the points were equi-distant from the lines from the focus, so that they soon desired to introduce into the curve the proportions they were introducing into their buildings. The Greeks studied the system of proportion in their buildings to a far greater extent than any other architects had since done, so that they wanted to introduce the proportions they were using in their buildings into their curves. By making the lines of definite proportions, they must result in one of two curves,—either the ellipse or the hyperbola. The ellipse was very rarely used in Greek work, but the hyperbola was in common use, the reason probably being that the ellipse was a much sharper curve than the hyperbola. The Greeks used the hyperbola, and with a definite proportion between the distance from the line and from the focus. The distance was called the eccentricity of the curve, and was designated by the letter ϵ. Now, turning back to the capital, he would consider what the Greeks did in starting from the use of the hyperbola. If they looked at early Greek capitals, it would be seen that they spread very widely over the column, and their age could almost be told by the diminution of the spread; in the late work the capital coming down in a very small diminution indeed. Therefore the Greeks wanted to do two things,—to reduce the spread of the capital, and to alter the curve, so that its eccentricity might always be in a definite proportion. First of all they simply used a hyperbola down almost to the point of the fillets, the remainder of the curve was just a little piece at the end which was apparently straight, but it was so small that it could hardly be determined whether it was straight or was part of a very large osculating circle. In the majority of capitals the line of the abacus would be found just above the origin of the curve. In the early capitals they would find three fillets, and afterwards four, and even five, as in the Parthenon. The capitals of the outer range of columns were not exactly the same as those of the inner range, and taking an example in the *pronaos*, the curve would be found to start at the hyperbola, and to come down to a point. The curve below was also a hyperbolic curve. One reason why the hyperbola was used was to decrease the spread of the capital, which was also decreased by another expedient. In the later examples, instead of the axial line being almost parallel to the side of the abacus, it became somewhat inclined, and the capital, of course, spread much less than the curve in the early examples. The fillets depended on the will of the architect as to whether they were in the line of the curve or in the line of the hyperbolic curve. Sometimes they projected, and sometimes they were in the line with it, as used by Ictinus in the case of the Parthenon. Although they were proceeding on rules of strict science, there was a large margin left for the individual taste and art of the architect,—the artistic instinct. He had put down the letter ϵ to represent the proportions, and to explain the eccentricities of the curve. These eccentricities were noticeable in the examples of various capitals: $\epsilon = \frac{3}{2}$ was what was found in the echinus of the Parthenon and Theseum, and they would also find the simple examples, $\frac{3}{1}$ and $\frac{\sqrt{2}}{1}$ in the echinus of the Propylæa. The conic sections were drawn by the Greeks by reason of a knowledge of the appropriate ratio of their eccentricities. They were told by Eratosthenes that the conic sections were discovered by a man named Menechmes, the friend and contemporary of Plato. Plato was born in the year 429 B.C., and died 348 B.C., while the Propylæa dated from 437–433 B.C., and the Parthenon was finished in the year 438 B.C. It was, therefore, evident that the Greek architects had used the conic sections before the great mathematicians had investigated their properties. Various theories had been started to explain this, and some men had stated that the Greeks used their mouldings with the conic sections simply because they had been studying the human figure, which gave them a thorough knowledge of beauty of lines, and that they tried these lines because they were beautiful. Another view, which was advocated principally by Mr. Penrose, was that the Greek architects were acquainted with the conic sections, and used them with the full knowledge of their mathematics. He hardly saw how that contention could be maintained in the face of the great historical evidence as to the investigation of the curves by men who lived a long while after the curves were used by the architects. It appeared to him more probable that the Greek architects arrived at the curves without knowing what they were. But they did know that all their points had the same ratio in their distance from the fixed point and the straight line or directrix. In additon to the capitals there were a number of other mouldings in Greek buildings, and in what he had said about the Doric capital his hearers would have gained an insight into what the Greek architect was thinking about in designing the mouldings, so that it would not be necessary to investigate them fully. Somewhat akin to the capitals of the column were what was called the capitals of the antæ. The "hawk's-bill" moulding was used in the antæ, and this bold moulding was adorned with polychromatic decoration. Referring next to the Greek Doric pediment, he said that the only simple circular moulding was to be found in the cymatium of the Parthenon. One remarkable point in connexion with Greek architecture was the difference between the Doric and the Ionic orders; though it was hardly correct to call them orders unless they were clearly understood to mean something more than columns and architraves. They were the styles and the outcome of different peoples, because there could be no doubt that the Doric and Ionic styles were the represen-

tations of two different races, living together, and forming part of the Greek nation at the time of the best period of its architecture, viz., after the Persian war. The Ionic people were probably akin to the Celtic race, while the Doric people were more like the Aryans; and in the two orders the characteristics of the races would be found exemplified. In the Doric order were to be found order and restraint, and the use of science and logic exemplified in their fullest development; while in the Ionic order refinement, luxury, and freedom of fancy were the dominant qualities. The Ionic capitals divided themselves into three groups, according to the relation between the circular part and the part above with the volute. Many examples of the first type existed amongst the fragments found on the Acropolis, while the second type existed principally in the Ionic buildings still remaining in Athens. Totally different from the types he had been referring to was another remarkable one, of which the most important example was to be found in the Temple of Apollo at Bassæ, and one which Frenchmen, in their modern style, had made use of on several occasions. Doric columns had no base. Doric antæ had sometimes, though not always, bases; but it was in the Ionic columns that the bases were to be found exemplified. The Greeks did all sorts of things with the Ionic bases. Sometimes there was an interlacing ornament on one of the upper members, and the flutings were of different shapes; and in the published drawings of the Erechtheum a rich variety could be found. He believed he had said enough to show that Greek mouldings were worthy of careful study, and that a great deal of the real principles of art might be learned from them.

Mr. W. J. H. Leverton, in opening the discussion, said the members were much obliged to Mr. Farrow for his interesting lecture. Mr. Farrow had said that Greek mouldings were unsuitable for our climate, but Viollet-le-Duc,—in his lectures on architecture, which ought to be read by every architectural student,—had shown that the best thirteenth-century work was nearly allied to Greek work as regards the mouldings. They had always understood that thirteenth-century work was designed to be seen in our dull atmosphere, and if the thirteenth-century work was suitable, then the Greek work, which was very similar to it, must also be suitable to this climate. This did not apply to all the mouldings. There was a great variety of Greek mouldings, indeed much greater than was generally supposed. Mr. Farrow had shown the simpler ones, but there were a number of others which could be seen by referring to Viollet-le-Duc's work. The hawk's-beak moulding, of course, would cast a shadow in the dullest atmosphere. He concluded by proposing a vote of thanks to Mr. Farrow.

Mr. Hudson seconded the vote of thanks. He said Mr. Farrow had spoken of the osculating curve as a curve which coincided approximately with one of the points of the hyperbolic or parabolic curve, but that could only be said in a very vague way. No conic section actually coincided with any circular curve, and it was only an approximation which could come under the definition of an osculating curve, as it could not be subject to any definite radius. Mr. Farrow had spoken of the ellipse as coming under the same characteristic as the circular curve with regard to the shadow thrown. They might have an ellipse in any possible proportion, and one which was so nearly a circle that it could not be told from one except by mathematical investigation.

Mr. W. T. Horton could hardly believe that the Greeks went into all these scientific processes about curves. His idea was that they simply sketched them out. They were then carved, and the Greek architect was able to study them, and make any necessary alteration. Professor Aitchison had said at the Royal Academy that the architect was able to study the mouldings after they had been carved in stone, and his belief was that the Greeks simply sketched them, and they were carved out in the solid, and altered, if necessary, until they met with the architect's approval. He would like to have some information as to the letting in of bronze or copper into the volute of the Ionic capital. An idea had been started that bronze or some other substance was let into these volutes, and perhaps Mr. Farrow could tell them something about that.

Mr. Cavanagh said he believed it was in internal work that Greek mouldings should be most used in this country. It was admitted now by architects that for internal work Classic detail was the correct thing, and it seemed to him a pity that the Greek mouldings were not used instead of the Roman. In plaster work, mouldings, and other matters, the most debased Roman examples were too often taken, when, if a little more discrimination were exercised by the architect, the very best Greek forms could be got as easily and as cheaply as those at present in use. It was a pity Mr. Farrow had not mentioned the best works on Classic detail. He believed Pennethorne's was one of the best, and he would also call attention to the large number of Classical mouldings to be seen in the upper galleries of the South Kensington Museum.

Mr. H. D. Appleton said that a type of the Ionic capital at Bassæ could be seen in the Haymarket. Mr. Penrose attributed the permanence of all Greek ornament to the fact that it assimilated to the sectional curve.

The Chairman said that Mr. Farrow commenced by talking of the love of Gothic that had grown in the mind of the architectural student, but, judging from what he (Mr. Slater) had seen, while on the Board of Examiners of the Institute, it was extraordinary to find the immense love of Greek architecture the institution of the Examination had fostered (laughter). On asking several gentlemen why they had chosen Greek, they had answered that it was easy to cram. At the same time, he did not regret that the Examination had fostered the study of Greek architecture, mouldings, and forms, because no one who studied them could fail to derive a great deal of benefit. He, for one, did not believe that all those beautiful Greek mouldings were worked on the strict mathematical lines Mr. Farrow had referred to. The most beautiful forms of Greek mouldings, and architecture of every kind, developed slowly and by degrees, and if they could only have seen the buildings which preceded the Parthenon, &c., he believed some of them would be found to have been ugly and rude, and that it was only gradually the beautiful mouldings now to be seen had been evolved. The number of possible curves was quite limited, and there were not many ways of joining one part of a curve with another part. A piece of straight line joined to a curve did not look so nice as if gradually worked off into another and approximating curve, and, as a matter of fact, people drew hyperbolas, parabolas, &c., because they could not help doing so. If some of the Early English architecture were worked up with the same nicety and accuracy which had been applied to the Greek mouldings, many of those parabolic and hyperbolic curves would be found in it, and no one could say *à priori* whether the parabolic or hyperbolic curve would be the more beautiful. It was only by judging from the effect of what had been done that they could arrive at the principles Mr. Penrose and others had worked out. Mr. Farrow had said that it was offensive to the Greek eye to see two things alike, and, no doubt, at the time of the erection of the Parthenon it would be offensive to the Greeks to see crude junctions of lines, but that would not have been the case a few centuries earlier. Mr. Farrow also said that the Greeks had the most beautiful white marble to work with, and yet it was an extraordinary thing that they should have been so fond of covering it with cement.

The vote of thanks was then put, and carried.

Mr. Farrow, in replying, said he had only entered upon the threshold of the subject, for such a matter as the colour decoration of Greek mouldings might easily occupy a whole evening. Mr. Leverton had rather misunderstood him as wishing to convey the impression that Greek mouldings were unsuitable to this climate. What he meant was that study of Greek mouldings showed the principles by which mouldings should be used. By applying those principles to their work and materials they would probably make use of similar curves, as doubtless their Gothic forefathers did in their mouldings. What they wanted to study was the effect of light and shade on the profiles they looked at. They would then see that the Gothic mouldings were essentially different from the Greek by the large amount of undercutting in order to obtain deep shade, as contrasted with the shadow, which was so valuable a part of the Greek work. The Greeks stopped their shadows as we should stop shade. (There was a marked difference between the two.) An example of Greek mouldings adapted to the English climate could be seen in Mr. Whistler's house in Tite-street, Chelsea, built for him from the designs of the late Mr. E. W. Godwin. The mouldings there were based upon Greek mouldings in their general principles, but the architect had accentuated many points so as to attain the result necessary in this climate. It had been stated by more than one speaker that although the curves are conic sections, they were not used by the Greeks as such. He had tried to explain that the Greek architects did not, as he believed, know they were conic sections, but were aware that they were curves of exceeding beauty, and easily drawn. That the curves the Greeks did use were those of the conic sections was abundantly proved by Mr. Penrose's careful measurements, for until he measured the Parthenon, nobody had measured Greek mouldings with sufficient accuracy to find out what the curves really were. He agreed as to the desirability of preferring Greek to Roman mouldings. If they wished to know the history of Roman mouldings, they should find out the most debased period of the Greek mouldings, which would be the time for the Roman offspring. He had not given a list of the best books of reference for the study of Greek architecture, as that would be found in the "Brown Book." No doubt the Greeks covered the marble with cement, but it was a very fine kind which gave almost a better surface than the marble itself. It was chiefly used where they had to make shift with rougher stones, and to bring them up as nearly as possible to the marble surface. There were few people now who were prepared to contend that the Greeks did not colour the whole of their buildings, although the colouring was sometimes very slight. Bronze was also undoubtedly used to a large extent in Greek work.

CRYSTAL PALACE SCHOOL OF ENGINEERING.

THE first term of the sixteenth year of the existence of the Crystal Palace School of Engineering closed on Saturday last. Mr. John Aird, M.P., presided, and presented the certificates awarded by the examiners, who were, on this occasion, Messrs. R. Hodson, C.E., M.E., and A. E. Preston, C.E., F.G.S., &c. The examiners appended to the schedule of awards reports commending as "exceedingly good" "most of the students' work," and stating that their work and the results of their *viva voce* examination testified conclusively as to the thoroughly sound manner in which they were taught, and the great credit due to Mr. Wilson, the principal, and his working staff.

The lectures of the term, on Steam, had been attended by thirty-five students, of whom twenty-nine were eligible for examination, and fifteen passed and received certificates. Mr. C. S. Angus was first with 237 marks, 288 marks being the highest number attainable.

For work in the drawing-office, ten students received certificates, Messrs. M. H. Butler and C. Caramwill equal firsts; in the smith and pattern shops, ten certificates, Mr. D. A. Andrus first; fitting-shop, ten certificates, Mr. E. Wright first.

Twenty certificates were awarded to students in the civil engineering division, second year's course. To students in the first term, for general surveying and the preparation of plans and estimates for Parliament, nine certificates were awarded, Mr. E. N. James first; second term, calculations, plans, and estimates for a railway and dock, seven certificates, Mr. E. Battersby first; third term, design and construction of existing and other engineering works, four certificates, Mr. E. J. Bowman first. Two certificates were awarded in the section for the study of electricity, theoretical and applied, Mr. H. C. Bergemann first. In the Colonial section, three certificates were awarded.

In addressing the students, Mr. Aird recommended their careful study of the splendid structure with which their school was associated, and gave some interesting particulars concerning its erection, upon which, as a young man, he had been employed, his special charge being connected with the building of the towers, and laying of the 15-inch main for the supply of the fountains. The great Brunel was asked to design the foundations of the towers, and did

so. The water-works upon which he (Mr. Aird) was employed were laid out by Mr. F. W. Shields. When the North Tower was in course of erection, he remembered their having a visit from Mr. Thackeray, the eminent writer, who expressed a desire to ascend to the top. His nerve failed him as he rose, and the distinguished author had to be carefully lowered by ropes. Mr. Aird expressed an earnest hope and desire that the Crystal Palace Company, who owned so unique a building, might be more prosperous than they had been for some time past. He ventured to throw out, advisedly and seriously, a suggestion that he thought well worth consideration, — that this, the original building of the first grand International Exhibition of 1851, should be again applied to a like use for another Great Exhibition in 1890 or 1892. No locality had greater advantages in situation, and the splendid building had abundant scope for extension. No place would be more likely to attract for their exposition and display the vast and varied improvements that had been effected in art, science, and manufactures. If a place like Manchester could achieve such a success as it had done with its Exhibition, it was surely possible to do the like in London. He felt assured that many who could aid such a project would regard it with favour, the great railway companies would liberally co-operate, and any necessary Parliamentary powers would be readily obtained. Mr. Aird concluded his address by some wholesome counsel to the students and complimentary references to his old friend Mr. Wilson, the father of the school.

Major Dickson, M.P., Chairman of the Crystal Palace Company, referring to Mr. Aird's suggestion of an International Exhibition, said that if the Company had many friends as true to it, and as willing to help, as Mr. Aird, they might entertain the idea hopefully, but there were not many such ready to express their sympathy in a practical form. He feared that Mr. Aird's suggestion was impracticable, unless the project were taken up and prosecuted earnestly by a great public organisation outside of the Crystal Palace Company.

Mr. Aird, responding, held to his suggestion as important and practicable, and recommended that it should be brought under the consideration of the Prince of Wales, who was successful in carrying out any project that he earnestly took up believing it for the public good.

Mr. Wilson, Principal of the school, gave some interesting particulars concerning some of the past students, and gave an illustration of earnest zeal and devotion to duty on the part of one of them, who had gone to Spain to superintend certain mining operations. He had to educate the natives, in so far as their work was concerned, and his presence daily was indispensable to the works being carried on. He was seized with a painful illness that would have been an ample excuse for his absence, but he preferred, rather than that the works should be stopped, to be carried to them in a litter, from which he gave his directions. Mr. Wilson said the young gentleman referred to was in that room, (and possibly displeased with this reference, but such a spirit as he had displayed was worthy of mention and of emulation.

The usual votes of thanks closed the proceedings.

Trade Conferences on Technical Education.—The sixth of the series of Trade Conferences on Technical Education was held last week at the City and Guilds' Technical College, Finsbury, and was devoted to the sheet metal trades. Mr. Hodgson Pratt, who presided, stated that until ten years ago there was more technical education in any fifth-rate German town than in the whole of the United Kingdom, and in particular referred to the Swiss schools. Although this was no longer true, he was surprised that the movement had not made more progress. A paper on the bearings of technical instruction was read by Mr. C. T. Millis, Superintendent of the Trade Classes of the College, explaining the system adopted. In the discussion which followed remarks were made by Mr. J. Deanes, Mr. Harrington, Mr. Akerman, Mr. Court, and the Principal of the College (Dr. Silvanus Thompson). The lack of interest on the part of employers in the proper scientific training of their apprentices was strongly animadverted upon. Resolutions were passed approving the course of instruction in the City and Guilds' College.

OBITUARY.

Professor de Chaumont, F.R.S.—The death is announced, at his residence at Woolston, near Southampton, on the 18th inst., of Surgeon-Major F. S. B. François de Chaumont, M.D., F.R.S., Professor of Military Hygiene at the Army Medical School, Netley. Dr. de Chaumont was born at Edinburgh in 1833, of which city his father, though a Frenchman by birth, was a resident, and his mother was a Scotch lady. Educated chiefly at Edinburgh, he successively obtained the degrees of M.D., L.R.C.S., and F.R.C.S. Entering the Army as Assistant-Surgeon on the 28th of April, 1854, Dr. de Chaumont served with the Rifle Brigade in the Crimean war from 21st May, 1855, and was present at the siege and fall of Sebastopol, for which he received the Crimean medal and clasp and the Turkish war medal. He became assistant in 1863 to Professor Parkes at Netley Hospital as Professor of Hygiene, and on the death of that distinguished man was appointed to succeed him, a position which he continued to hold at the time of his death. He edited several editions of Professor Parkes's works, and in many other ways rendered service to the cause of medical science, and was also an accomplished linguist.

Mr. Matthew Holbeche Bloxam, F.S.A., the well-known antiquarian writer, died at Rugby, on the 24th inst., in his eighty-fourth year. His first publication, "The Principles of Gothic Architecture," appeared sixty years ago. This was succeeded by the following works:—"A Glimpse at the Monumental Architecture and Sculpture of Great Britain, from the earliest Period to the Eighteenth Century," 1834; "Sepulchral Effigies and Monuments in Bottesford Church, Boston Church, and Worcester Cathedral," 1862–70; and "Some Account of the Rectory and Rectors of Rugby," 1876. Mr. Bloxam's "Principles of Gothic Architecture" has passed through eleven editions.—*Times.*

Mr. John Warrington Morris, of Fenchurch-street, was buried on Monday last at Richmond. He was fifty-nine years of age, and was a Fellow of the Institution of Surveyors. He was well known in professional circles as a rating surveyor. Besides the members of his family, there was a considerable gathering of professional friends at the funeral, including Mr. E. L. Bracebridge and Mr. H. Hooper, both of Poplar, with whom he had worked for many years; also Mr. F. Warburton Stent, and many clients and business friends.

Mr. William F. Meakin.—We regret to have to announce the decease of Mr. William Fountain Meakin, the well-known London quantity surveyor, which occurred at Hersham on the 20th inst., at the age of eighty-three. Mr. Meakin was articled about the year 1818 to Mr. Broadbridge, of Lincoln's-inn-fields, who belonged to the old school of "measure-and-value" surveyors, and was one of the pioneers of the modern system of quantity surveying. Mr. Meakin commenced practice soon after he was out of his time, at Peckham. He subsequently removed to Trinity-square, Southwark. In those days the custom was, almost invariably, for the builders who were invited to tender for works to meet to appoint the quantity surveyor, and Mr. Meakin, by his painstaking habits and accuracy, soon obtained such a reputation as enabled him to command the votes of the builders, whose confidence he gained as well as that of the architects whose works were estimated. About the year 1847 he removed to Tokenhouse-yard, and from there, in 1852, to Martin's-lane, Cannon-street, where he has practised ever since. The railway system brought him a considerable amount of work, and during the time that Mr. Bunning was City architect, he prepared the quantities for all the City work. Many breweries, workhouses, and other large public and private buildings also passed through his hands. About the year 1859 he was appointed by Mr. Sidney Herbert (Secretary at War) one of the four surveyors to the War Department, and as such had allotted to him all the Government works in the London, Dover, Brighton, and Eastern Districts. His services were frequently called into requisition in disputed building cases, either as arbitrator or umpire, and he was at one time a well known and able witness in "compensation" cases. In later years, Mr. Meakin relinquished his quantity practice, and undertook the management of several large estates, including the Hove Estate at Brighton, for Baron de Goldsmid, the Marquess of Camden's Camden Town Estate, the Earl of Listowel's, and other important properties. About the year 1879 he was joined in partnership by his son, Mr. Frederick Meakin, and since then the practice has been carried on under the style of W. F. Meakin & Son.

Illustrations.

DECORATION FROM THE SPADA PALACE, ROME.

THE Spada Palace, now used as the Court of Cassation, stands in the Piazza di Capo di Ferro. It was erected about 1564, from the designs of Giulio Mazzoni, for the Cardinal Capo di Ferro, and decorated by Borromini in a manner consistent with the ornate character of the external architecture, and with the luxurious and ostentatious taste of the period. The palace contains a small collection of sculpture and antiques, among which the colossal statue of Pompey is the chief treasure; also a small collection of pictures, some of which may, perhaps, be by the masters to whom they are attributed.

LIVERPOOL CATHEDRAL COMPETITION: DETAIL OF PART OF MR. BROOKS'S DESIGN.

WE publish the larger scale external and internal elevations, and the section, of one bay of the choir in Mr. Brooks's design for the Liverpool Cathedral. Though the competition has come to such an untimely end, the value of the drawings made for it is permanent; and these large-scale drawings will probably be valued by young students of Gothic architecture especially.

HOUSE AT COOMBE, NEAR SHAFTESBURY.—PROPOSED STABLES.

THESE stables and the buildings connected with them are situated near Mr. Beaufoy's new house, and will be built of local stone (greensand), with strings and mouldings of red Farleigh. In addition to the stables and men's rooms there is a private work-room for Mr. Beaufoy's use and also rooms for the engine and dynamo, &c., required for the electric lighting of the house. This will be carried out by the Anglo-American Brush Electric Light Company. The builder will be Mr. Dart, of Crediton, who is doing the house now nearly completed. The architect is Mr. J. Towry Whyte.

MUSIC: DESIGN FOR STAINED GLASS.

THIS design for a window suitable for Renaissance surroundings is by Mr. James West, who has gained, we understand, a medal for decorative design in the national competitions of the Science and Art Department, where the decorative design is usually the best part of the work sent in; and also a Society of Arts medal for the same class of work.

The positive colour, in the original drawing, is chiefly in the draperies, red and blue predominating in the drapery of the seated figures and pink in that of the standing figure. The architectural portions are mostly in grey neutral tones, enriched partially with yellow stain.

OLD GUILDHALL, LAVENHAM.

THIS old half-timbered house derives a good deal of its picturesque effect from the bold projection of the upper story and its richly moulded beams, and from the treatment of the ground-floor windows, in which the upper divisions are carried along continuously round a great part of the building, with a delightfully piquant effect. The treatment of the timber framing in a continuous series of vertical posts is somewhat monotonous in effect.

SCRAPS OF ANCIENT GERMAN IRONWORK.

THE best of these is the lock from St. Sebald's, a very fine bit of freely treated work. All the examples have character of their own, and are of interest as illustrating German taste in this class of work; the bit from the bishop's throne at Ulm is very good. The grille is too masonic in style for ironwork, but the manner of fixing it to the wall is praiseworthy.

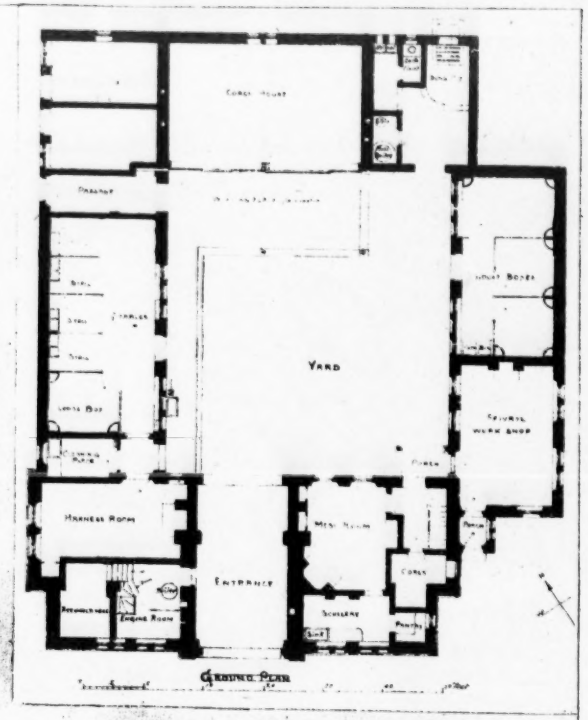
PHOTO-LITHO. SPRAGUE & Co 22, MARTINS LANE, CANNON ST. LONDON, E.C.

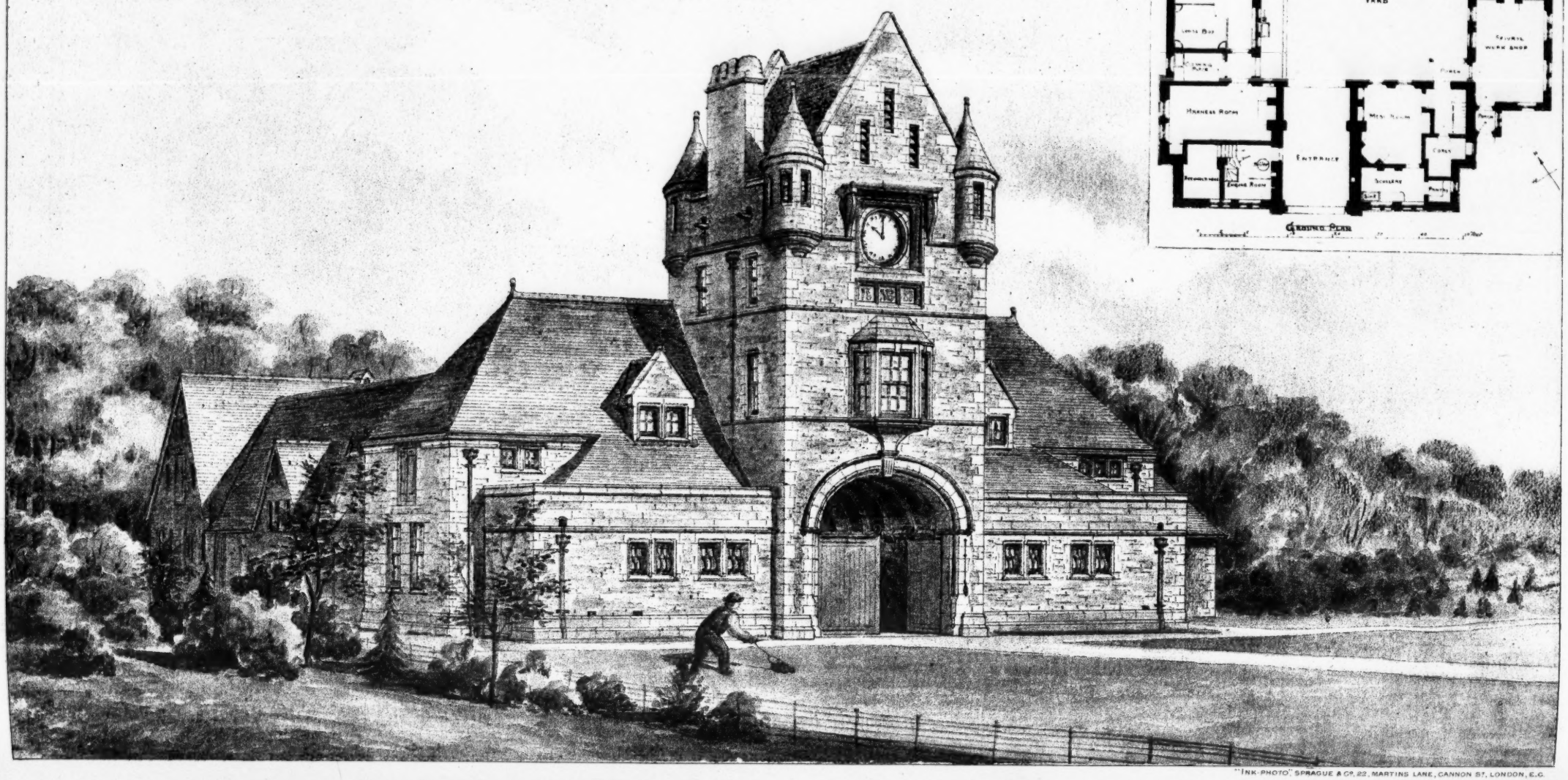
THE OLD GUILDHALL, LAVENHAM, SUFFOLK.

THE OLD GUILDHALL, LAVENHAM, SUFFOLK

The Phototype Co., 303, Strand, London.

DECORATIONS IN A ROOM OF THE SPADA PALACE, ROME.





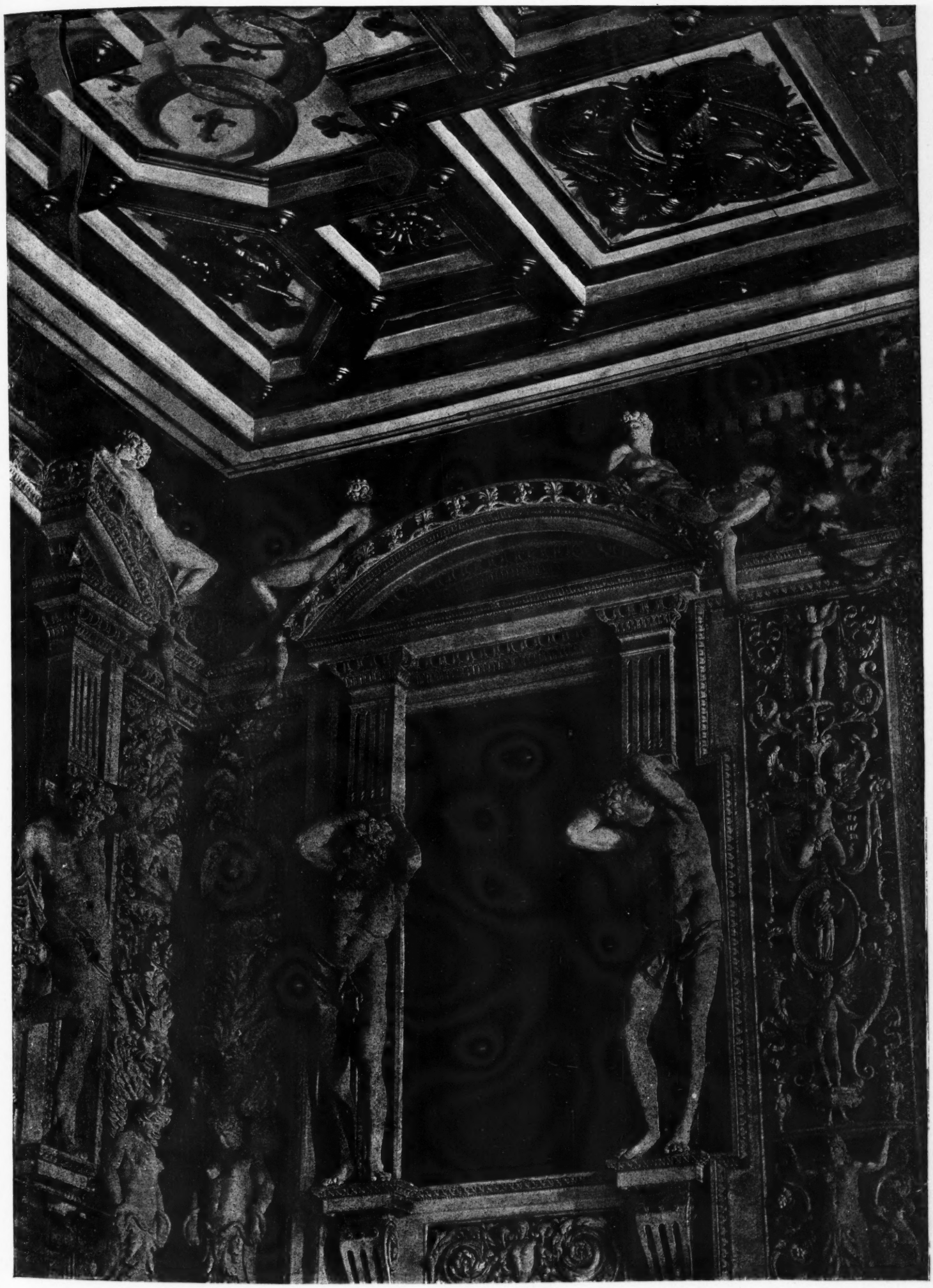
"INK-PHOTO" SPRAGUE & Co. 22, MARTINS LANE, CANNON ST, LONDON, E.C.

STABLES FOR A HOUSE AT COOMBE, NEAR SHAFTESBURY.—Mr. E. Towry Whyte, Architect.

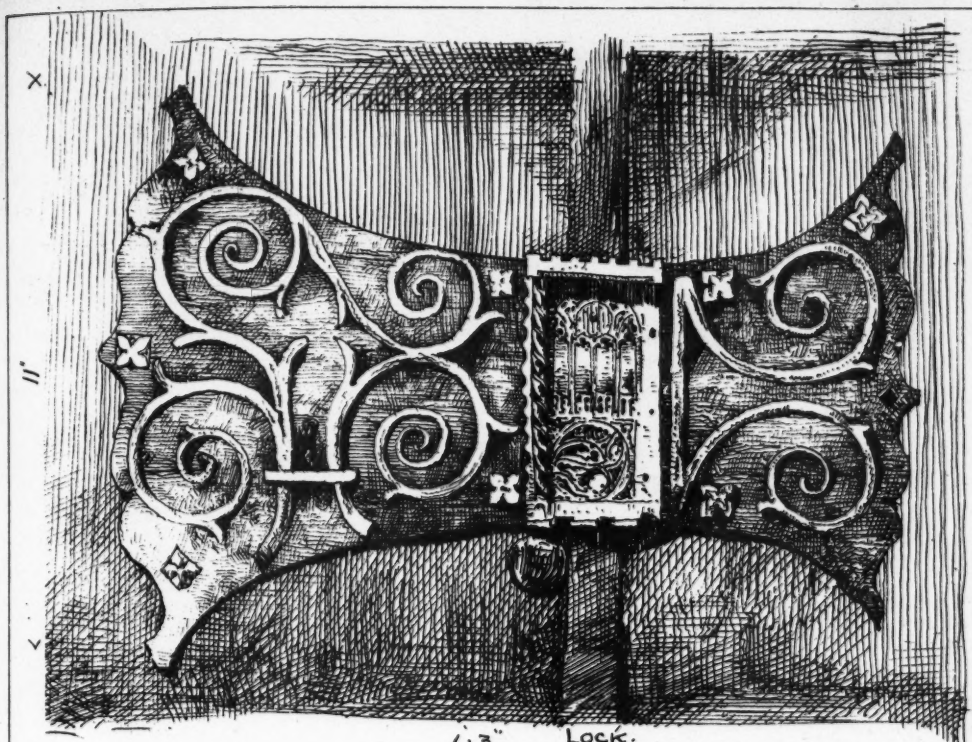
"INK-PHOTO" SPRAGUE & Co. 22 MARTIN'S LANE, CANNON ST, LONDON, E.C.

"MUSIC."—A DESIGN FOR STAINED GLASS: BY MR. JAMES WEST.

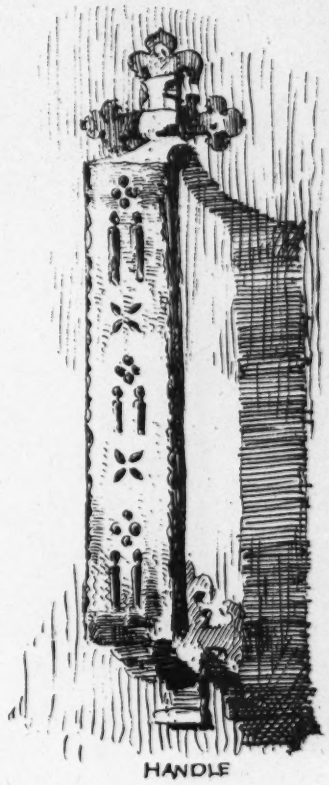
STABLES FOR A HOUSE AT COOMBE, NEAR SHAFTESBURY.—MR. E. TOWRY WHYTE, ARCHITECT.



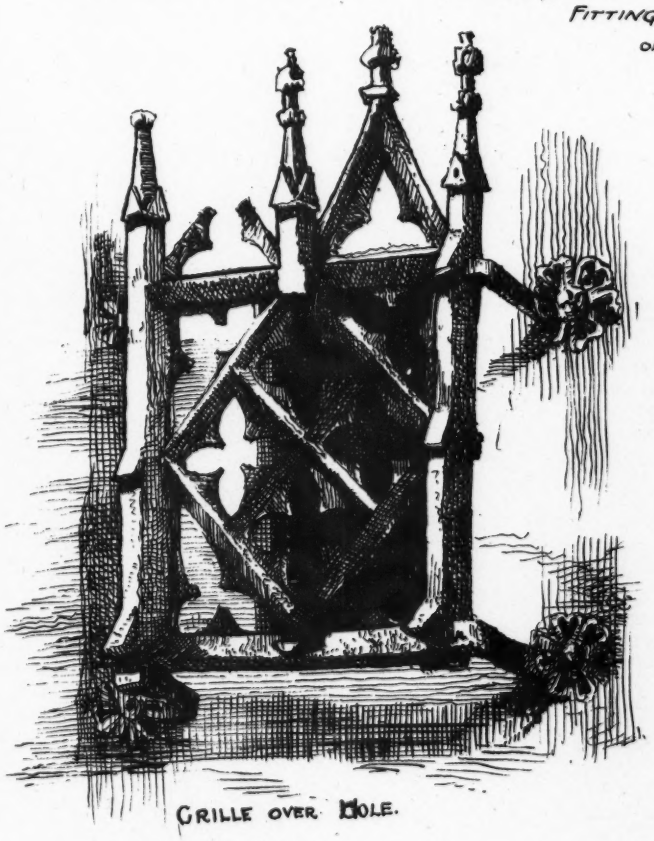
DECORATIONS IN THE GALLERY OF THE SPADA PALACE, ROME.



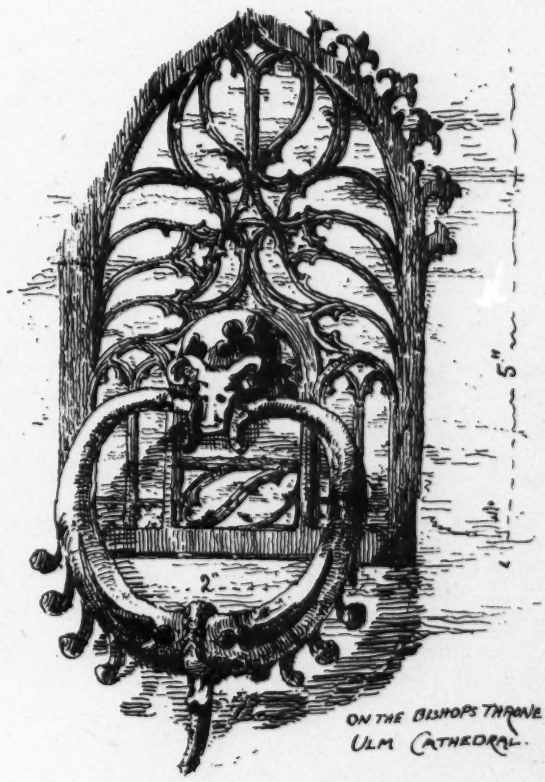
Lock.
St. Sebald's Nuremberg
Fittings on the Doors of the Sacramentshaus.



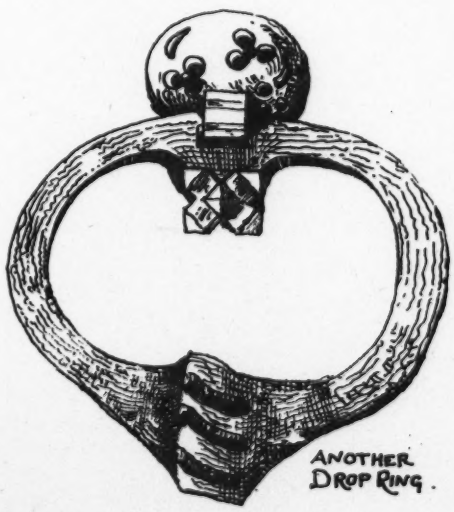
Handle



Grille over Hole.



On the Bishops Throne
Ulm Cathedral.



Another Drop Ring.

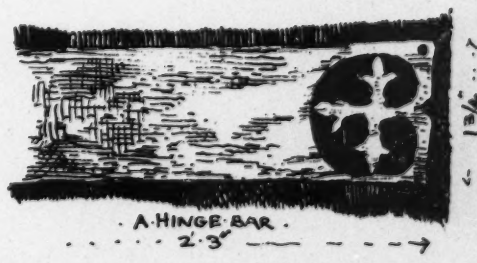
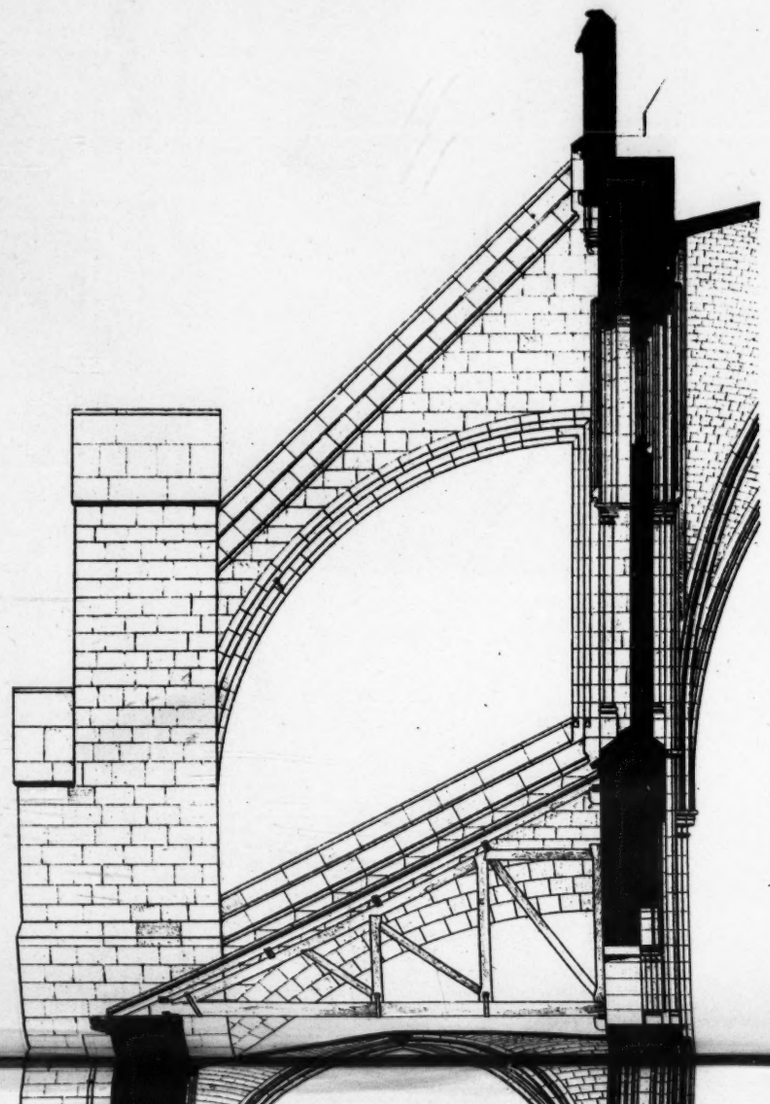
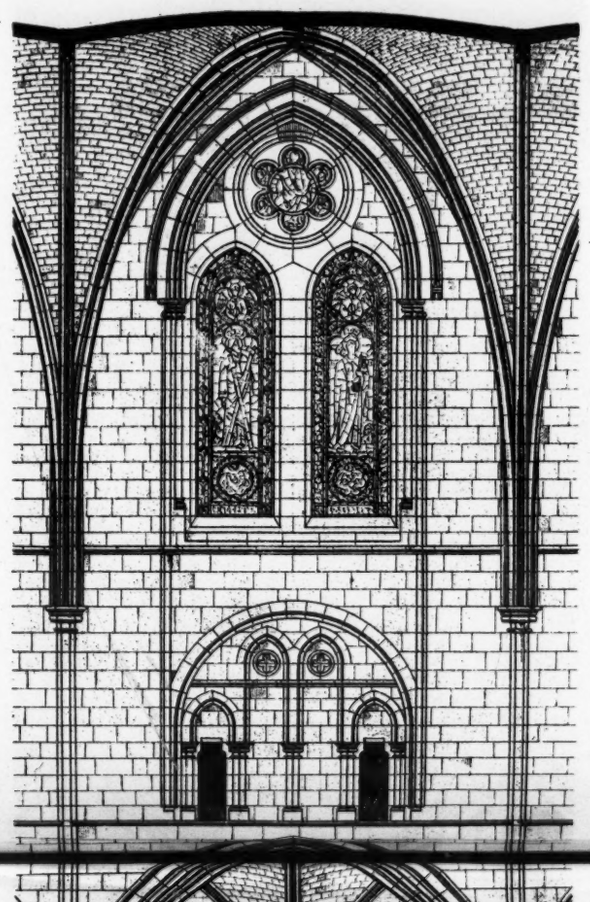
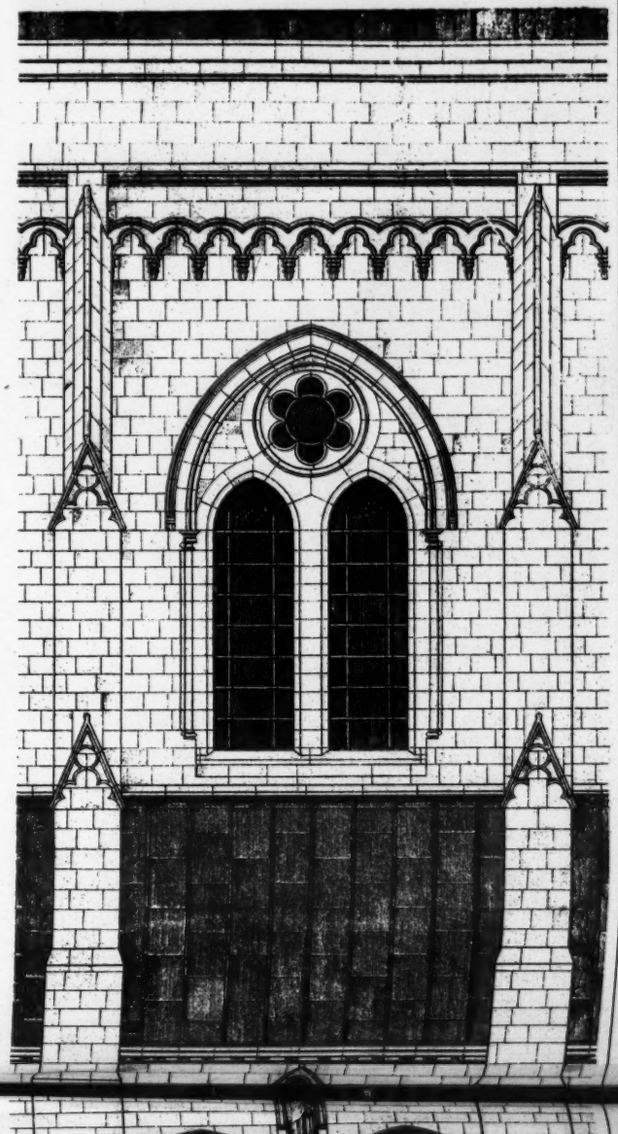


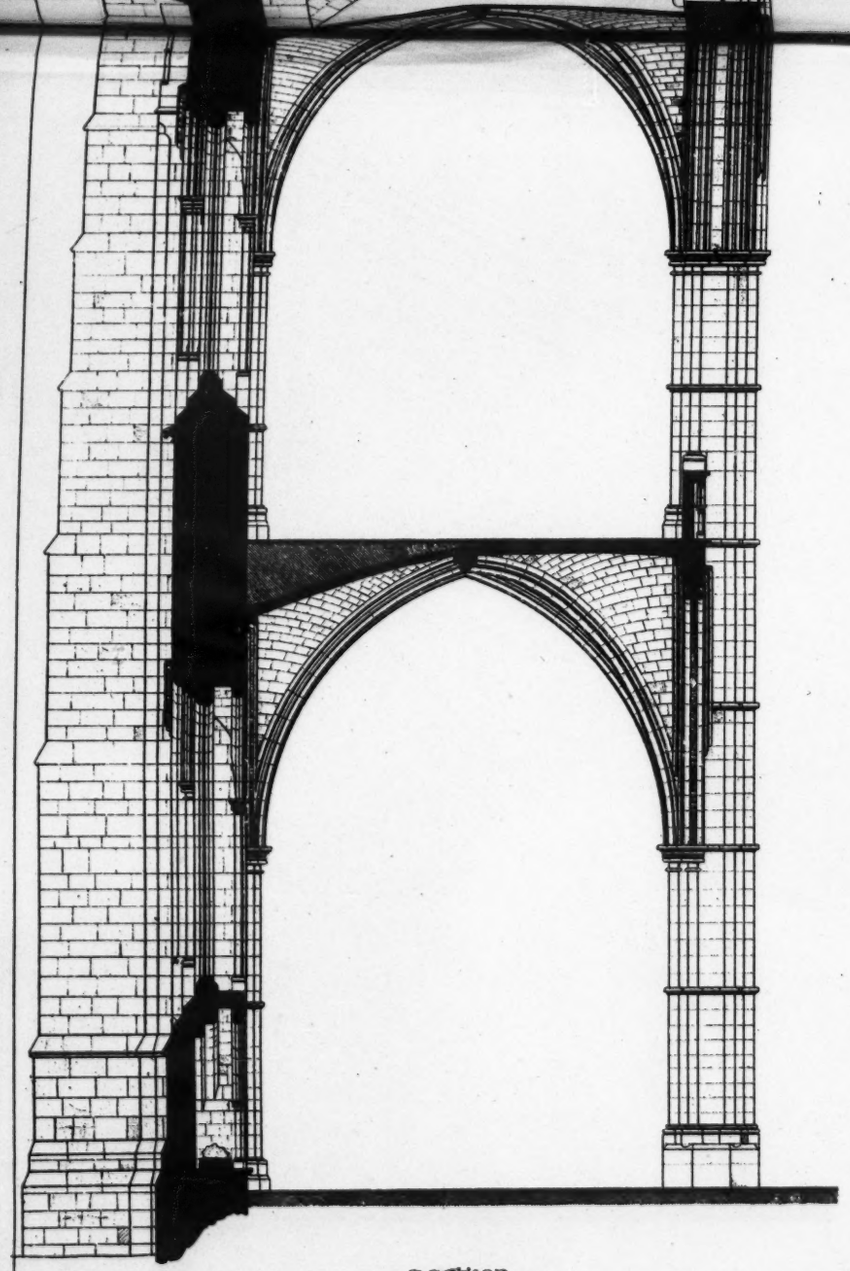
PHOTO-LITHO. SPRAGUE & Co 22, MARTINS LANE CANNON ST. LONDON, E.C.

SCRAPS OF ANCIENT GERMAN IRONWORK.

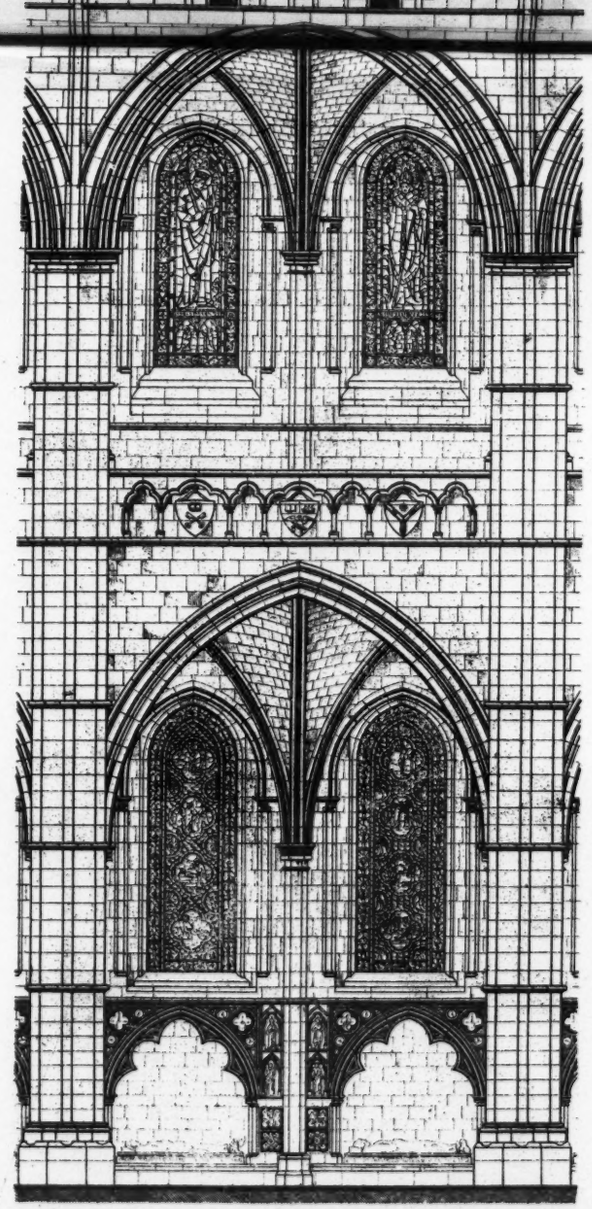




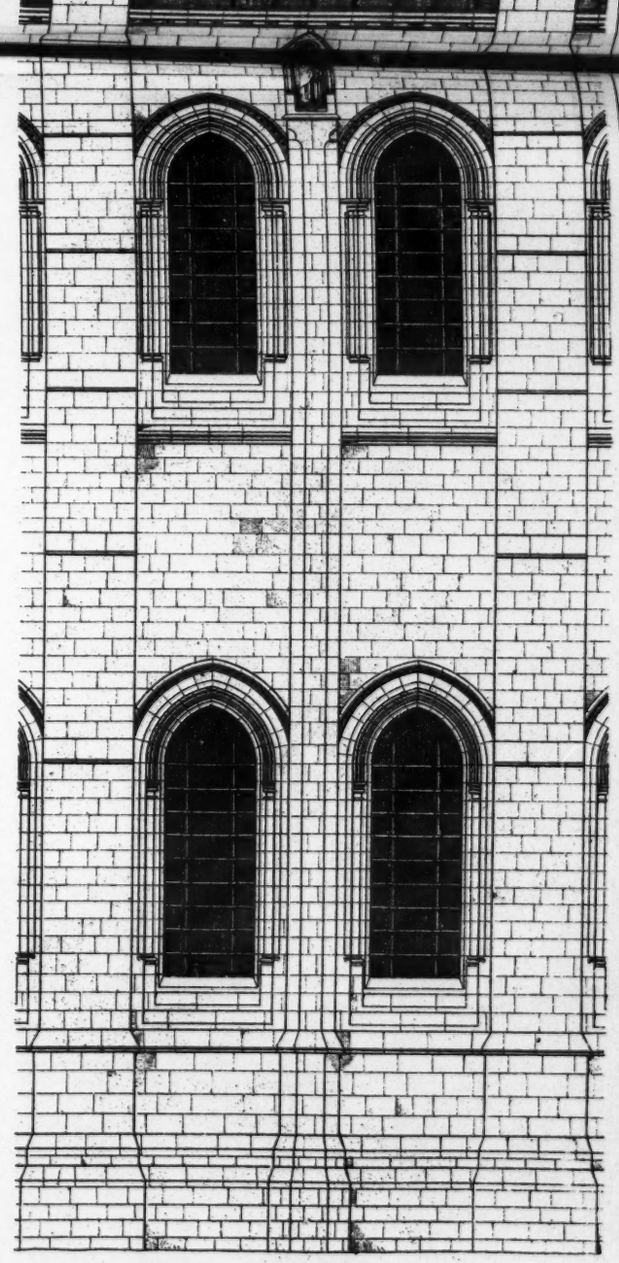




SECTION



INTERIOR



EXTERIOR

0 5 10 20 30 40 50 Feet

PHOTO-LITHO. SPRAGUE & Co 22, MARTINS LANE, CANNON ST, LONDON, E.C.

LIVERPOOL CATHEDRAL COMPETITION:
STUDY TO LARGE SCALE OF ONE BAY OF CHOIR.—Mr. James Brooks, Architect.

NATIONAL REGISTRATION OF PLUMBERS.

At a meeting of the Liverpool Architectural Society on the 16th inst., in the Royal Institution, Colquitt-street, Mr. E. Kirby, President, in the chair, Dr. Vacher, Medical Officer of Health for Birkenhead, read a paper on "Defects in Plumbing and Drainage Work." Dr. Vacher gave numerous instances of defects, some of which had come under his own notice, and said the health of the people was daily in jeopardy owing to the carelessness and ignorance of those men to whom was entrusted the plumbing and drainage work of our houses. He cordially supported the movement for the national registration of plumbers, by which all who followed the ancient and honourable craft should have adequate knowledge and skill.

Mr. T. Harnett Harrison explained the objects of the movement instituted by the Worshipful Company of Plumbers, London, for the examination and registration of plumbers. The system had now been in operation in London for two years, and was being rapidly extended throughout the country by establishing district councils consisting of representatives of the public and of the trade, who nominated examiners. He moved a resolution sympathising with the movement, and urging that a branch of the organisation should be put into force in Liverpool and district.

Mr. Aldridge, in seconding, remarked that with the large amount of speculative building in Liverpool, the registration of plumbers was a necessity.

Dr. Taylor, Medical Officer of Health for Liverpool, said that instances were continually being brought to his knowledge where defective plumbing and drainage work were the causes of a very large amount of sickness. He did not altogether blame the plumbers, for if owners of houses would have work done so quickly and cheaply, it must be scamped. He supported the system of registration, which the Health Committee of the Corporation, he might say, looked upon with great favour.

In the course of the discussion which followed, Mr. George Peet observed that plumbing work in Liverpool had of late years greatly improved.

The resolution was carried, and it was agreed to give every assistance to, and to take part in, the formation of a district council.

SALE OF THE LATE MR. GODWIN'S HISTORICAL CHAIRS AND RELICS.

On Thursday, the 19th inst., Messrs. Rogers, Chapman, & Thomas disposed of the late Mr. Godwin's collection of historical chairs and relics, formerly belonging to well-known literary celebrities and others, the sale taking place at the house in Cromwell-place. It may be stated in the outset that several of these chairs were illustrated and described in the *Builder* for 1878 (March 30 and Dec. 7). The number of lots was forty-three, of which thirty-two consisted of chairs. Most of the chairs had from time to time come into Mr. Godwin's possession by purchase, whilst others were presents. We give particulars of the sale, in the exact order in which the several lots were sold, with the price realised for each, and the total proceeds of the sale. The first lot submitted was the favourite chair of Lord Lytton, in which at Craven Cottage, Fulham, he wrote many of his earlier works. It was sold for 13 guineas; Shirley Brooks's oak writing-chair, 1 guinea; Planché's oak Glastonbury chair, 3½ guineas; John Britton's oak Glastonbury chair, 2 guineas; Hepworth Dixon's oak chair, ½ guinea. An easy-chair of Mrs. Browning's, 5 guineas; Mrs. Siddons's bamboo easy-chair, which she used when playing *Queen Katharine* and other characters, 7 guineas. An arm-chair of Samuel Warren's, bought by Mr. Godwin at the sale of his effects, 2 guineas. John Gay's library chair caused a spirited competition. It is fitted with pen-and-ink drawer, stationery drawer, writing-flap, and secret correspondence drawer. It was illustrated in the *Builder* on one of the dates mentioned, and may be described as a curious adaptation of means to an end. Longmans published a descriptive notice of it, in a small volume, in 1820, the frontispiece containing a drawing of the chair. It was sold for 30 guineas. Mr. S. C. Hall's oak arm-chair fetched 5 guineas; Mrs. S. C. Hall's easy-chair, 2½ guineas; and Mr. E. M. Ward's gentleman's arm-chair, 5½ guineas. An oak arm-chair, used by King Charles II. at his councils held at Yarmouth, fetched 10 guineas; the elder Charles Mathews's chair, 2½ guineas; Cruikshank's writing-chair, 2 guineas. Theodore Hook's library-chair, the back pivoted and folding down on to the arms to form a circular-top table, went for 19 guineas. Anne Boleyn's chair, which came out of Hever Castle about forty years since, brought 10½ guineas; Sir Gilbert Scott's arm-chair, 3 guineas; Dante Rosetti's arm-chair, 1*l.* 9s.; Sir Walter Raleigh's arm-chair, 2 guineas; Dr. Watts's arm-chair, 3½ guineas; Walter Savage Landor's arm-chair, 3½ guineas; Anthony Trollope's library-chair, 3 guineas; Thackeray's easy-chair, 3½ guineas; Sir Edward Landseer's easy-chair, 2 guineas; Sydney Lady Morgan's Louis Seize arm-chair, 4½ guineas; Pope's oak angular arm-chair, 5½ guineas; Nathaniel Hawthorne's painted folding arm-chair, 15s. Shakspeare's chair, described as "the crown of the collection," and in which the poet is said to have written many of his plays, was sold to Mr. Ledger, of the *Era*, for 120 guineas. Lord Byron's Louis XIV. chair realised 2½ guineas; and two Louis XIV. chairs, formerly the property of the first Napoleon, 1½ guinea each. The other relics included a candelabra, formerly belonging to Macready, 5 guineas; Wordsworth's cheval fire-screen, 6 guineas; Tietjens's music-stool, the needlework worked by herself, 7 guineas; the elder Napoleon's flower-stand, 5½ guineas; his set of six china plates, painted in Classical subjects, 2½ guineas; and his mahogany coffee-table from St. Helena, 3 guineas; Dr. Johnson's banner-screen, from Jack's Coffee House, Dean-street, Soho, 2½ guineas; Tom Moore's mahogany writing-table, 2*l.* 6s.; Sir Edward Landseer's frame scroll and couch, 1½ guinea; Macready's table, in tulip-wood and ormolu, 6½ guineas; Louis Napoleon's china dessert service, from the Tuileries, 3½ guineas; Charles Dickens's cribbage-board and a paper-weight with dog mount, 5 guineas; Tom Moore's double-barrelled fowling-piece, 1½ guinea; and Bulwer Lytton's candelabra, 3 guineas. The entire proceeds of the sale of the chairs and relics amounted to 324*l.* 7s.

LEGISLATION FOR ARCHITECTURE.

Sir,—Now that the Registration Bill is withdrawn, the subject of "closing" the architectural profession may be considered from a theoretical point of view. Much misapprehension exists with regard to it, both as to what legislation would declare illegal, and as to the results to be expected from an Act of Parliament.

As to the first, any one who has noticed the discussion and correspondence that preceded and accompanied recent events, must have been struck with the marvellously crude ideas therein displayed as to the very principles that must form the basis of any legal measures. Not only by comparison with dissimilar instances of registered bodies have delusions been upheld, but ignorance of the very facts of the instances themselves has characterised some of the utterances of pro-registration advocates.

Such hopes as, "to make it illegal for any one to draw plans," "to prevent any one from practising as an architect or surveyor," are of the nature of "large expectations" not even realised in the most privileged of the fine old professions that have found special legal shelter. Any one may, if he can, do anything that any professional does, with the exception of some acts of a public or semi-public nature.

The medical profession is often instanced. There, the growth of generations has developed homogeneous educational and examining faculties, by which alone proper training and credentials can be furnished. The Medical Acts did not form, but consolidated, its status and privileges, and prevented outsiders from assuming them; but the most anti-medical herb-doctor, pill-maker, or "quack," as well as the hydropathist, electrician, and "massager," is at liberty to try to cure all who like to go to him, and without a well-grounded popular opinion of the superior training, integrity, and experience, of registered medical men, the Acts would be of little benefit.

The legal profession has a somewhat similar history, and although there may have been less urgency for closing that profession, its place in legislature enabled it to carry self-benefiting measures which no other party could have accomplished. With all its protection no one is debarred from being his own lawyer, or doing a great many things which come within the circle of a solicitor's practice.

But in applying any legislative parallel to the architectural profession, we are met on the outset with a difference not thought of by our law-invoking friends. An architect's duties chiefly consist of designs and supervision of work carried out by others. Many men, not yet very old, can remember the high-and-dry position of the profession even thirty or forty years ago; an architect, in many towns, was a lonely and little thought of being. Now the increase of numbers and patronage indicates a growing popular appreciation of our art and science, and as the public more fully see that to employ an architect means better planning and design, better construction and sanitation, more work will follow. But with all advances it is yet true that at present only a small proportion of building comes under any architect's control. The profession is in the eye of many even now an almost unnecessary luxury, so that to attempt to raise the high wall of legal exclusivness round it has an aspect of grim humour. Too few already walk in the pleasant fields of our art, and an opinion that nearly as much art, and more *value*, can be got elsewhere, has to be lived down, and cannot be rooted out by Act of Parliament. Should the ridiculous hopes of the most extreme become law, such law could only, on the whole, be disastrous, and tend to induce a more universal shunning of the profession.

In Medicine and Law the practitioner himself carries out the case: in Sculpture and Painting the artist is doing the very work his client becomes possessed of. In no profession is there any strict analogy to ours. If we could suppose such a change in the medical profession as to make its members a sort of consulting body, whose directions were executed by, say, chemists, we should have somewhat similar conditions. The professional man would be employed for special or dangerous cases, and by wealthy persons; the multitude would go direct to the lower practical body. To pursue the analogy: leading architects would, as now, be resorted to for important works, and builders would do the needful in all ordinary cases.

With the crude, imperfect nature of the late Bill, and its public-spirited (?) rise and progress, we need not now be concerned. At present the aim should be to form a high standard of professional proficiency, based on solid constructional knowledge; a true appreciation of art in conjunction with the needs and appliances of the day. Then will not only present success be promoted, but future solidity be ensured, and the way prepared for any needful restrictions.

T. R. H.

ST. GEORGE'S HALL, LIVERPOOL.

Sir,—I trust that Mr. Blashill's suggestion [see *Builder*, p. 287, *ante*] with regard to the exterior of St. George's Hall, Liverpool, advocating the application of moist steam, and, if necessary, some mild detergent, for the purpose of removing the dirt with which it has become encrusted, will not be adopted by the Corporation. The proposal to cleanse stonework, &c., by means of a jet of water from a fire-engine might, perhaps, be carried out without occasioning much injury to the appearance of the fabric, but the application of moist steam or an acid would most certainly destroy the weathering of the stone, and would facilitate the decay of the surface, as well as impair the texture and colour of the masonry. Some years ago,—namely, in 1873,—the front of Hanover Church, Regent-street, one of Professor Cockerell's works, erected in 1823, was cleansed under the direction of Mr. E. C. Robins, who visited Paris for the purpose of obtaining information as to the mode in which the process of cleaning and scrubbing buildings as enjoined by the building regulations in force under the Third Empire were carried out, and who was so delighted with the result of his operation, that he communicated the particulars of the process to the Institute, and his paper was printed in the Institute Transactions (Trans. R.I.B.A., 1873-74, pp. 98-101). The plan adopted was to apply a steam jet from a specially-constructed boiler, chemicals being mixed with the water, and the stone was afterwards rubbed down with hair and wire brushes. At first strong lyes were used previously to applying the steam jet, but this was discontinued. The cost of the operation was 280*l.*, and Mr. Robins claimed that he had resuscitated the natural colour of the stone. The result of this treatment has been most disastrous to the building; the stonework, which was of a delightful orange tint, occasioned by the oil with which it had been coated, is now a dull, muddy brown colour, and the columns show unmistakable signs of decay. I feel very little doubt that this decay is due to the removal of the weathered surface of the stone.

Mr. Waterhouse's New University Club, in St. James's-street, and Sir Horace Jones's Sovereign Assurance Office, in Piccadilly, have been recently subjected to similar treatment, and the two buildings present the same bleached, woe-begone appearance which is observable in Hanover Church.

Jno. Hebb.

BATHS AND WASHHOUSES COMPETITION, ST. GEORGE'S, HANOVER-SQUARE.

Sir,—In last week's *Builder* [p. 279] is a paragraph containing a list of the competitors, in which you have unwittingly substituted the name of my late lamented father, Thomas Allom, for my own.

Arthur Allom.

THE "HEIM" SYSTEM OF HEATING.

SIR,—Were I to vary any part of my letter on the above subject (see *Builder*, pp. 264–65, April 21st) in compliance with the wishes of Mr. Boyd, as expressed in his letter in your last issue (p. 289), I should so vary contrary to facts within my own knowledge; I venture to hope that even Mr. Boyd would not desire this at my hands for his own personal gratification.

Elaborately-woven claims to excellence, by whomsoever presented, to be worth anything, must be able to stand the stern logic of applied tests. In this case I will state facts, and leave your readers to judge for themselves whose claims are sustained. In a large class-room in one of the London Board Schools there is a capacious "hygiastic" grate by some maker,—who he is it is not necessary to say, as all open grates are supposed to be "hygiastic." The caretaker of the school told me "that with this large grate filled with burning coals he was never able in cold weather to raise the temperature more than from 6° to 7° above the temperature out of doors; to make the room bearable it was necessary to keep the gas constantly burning." The heat of the fire was "hygiastically" conveyed up the flue so as to warm the cold air floating in space above the chimney-tops! The consumption of fuel in this grate was 60 lb. a day.

For the purpose of testing, a "Heim" stove was put into this room about five weeks since, the grate was blocked up and the stove temporarily fixed. The fire was lighted and the glowing coals were open to be seen by every visitor present; the temperature was speedily raised to summer heat in every part of the room equally, the caretaker stating that "the room had never before been so successfully warmed." Every person present, including the Board's Architect, expressed the most complete satisfaction felt as the result of the test. The consumption of fuel was from 20 lb. to 25 lb. a day. After these details should Mr. Boyd's "Hygiastical Grate" business materially suffer, he will be bound to consider himself the architect of his own misfortune, as, in the letter you kindly published for me there is not a single reference to the word "grate:" the responsibility is his for compelling me to give the foregoing details.

Messrs. Körting show clearly in their letter that they have no knowledge of the "Heim" system, but they have used your columns in their attempt to disparage that system in their own interest. After studying and personally examining various systems in use for heating and ventilating public buildings, in the interest of the London schools, I gave a plain statement in favour of that which I believe is the most effective and the most successful system on every ground that has yet been offered to the English consumer. I felt, and I still feel, that in so doing I was conferring an actual benefit upon my fellow-subjects, and that I was discharging a duty neither useless nor unwise.

April 23. J. RUSSELL ENDEAN.

PROVINCIAL NEWS.

Brighton.—"The Brighton Marine Palace and Pier Bill," now before Parliament, has been under consideration by the Brighton Town Council, on a recommendation from the General Purposes Committee to the effect that the petition lodged against the Bill by the Corporation should be withdrawn. The Committee reported that since that petition was deposited, negotiations had been carried on between the Committee and the promoters of the Bill, with the result that the latter had adopted an amended scheme, and had inserted certain clauses for the protection of the Corporation. The outcome was that the Committee considered the present scheme was much to be preferred to that of the Act of 1883. The proposals now made with regard to the scheme are as follows:—It was originally intended to construct a new pier on the site of the existing Chain Pier; but, instead of that, it is now proposed to build the new pier about 25 yards to the east of the stone groyne opposite the Albion Hotel. It will extend southwards about 2,000 ft. from the sea wall, or about 850 ft. further seawards than the Chain Pier, which is to be entirely removed; and provision is made for the construction of landing and shipping stages, saloons, pavilions, assembly and concert rooms, reading and refreshment rooms, and baths. The promoters bind themselves to convey to the Corporation, in fee simple in possession, the site of the present Chain Pier and the whole of the property of the Chain Pier Company on the northern side of the Madeira-road, and extending from the Chain Pier steps on the east to the Aquarium on the west. It is provided that, before commencing any new works, the promoters shall purchase and remove all the property of the Chain Pier Company, and unless that is done within three years from the passing of the Act, the powers conferred by it shall cease. No buildings are to be erected on the pier within 380 ft. from the northern end, except two circular or octagon toll houses, not exceeding 12 ft. in diameter, and 16 ft. in height. Between the above-mentioned distance from the entrance and 1,400 ft. from the same end, the structures on the pier are not to be more than 15 ft. wide, 30 ft. long (from north to south), and 20 ft. high; and the buildings at the head are not to exceed 90 ft. from east to west, 140 ft. from north to south, and 39 ft. in height. It is stipulated that the pier and works shall, as far as practicable, be so constructed as to allow free passage for boats under the pier. The recommendation for the withdrawal of the petition against the scheme was carried by a large majority, although Alderman Abbey and other members expressed regret at the contemplated destruction of the Chain Pier.

Bristol.—The new granary now in course of construction at the Harbour Railway Wharf is approaching completion. The tender of nearly 30,000*l.* of Messrs. Storrs, Sons, & Co., Limited, of Stalybridge, was accepted, and that firm commenced in April last the work of raising the granary on the foundations which had already been put in. The building, according to the *Bristol Times and Mirror*, has a frontage of 236 ft. 6 in. to the water, is 99 ft. wide, and is 95 ft. high from basement to parapet. At the top, facing the harbour, will be a panel parapet bearing the date 1887, and over this are to be placed the city arms, in cast iron. There are nine floors, including the basement, the latter, which will be used as a hauling-way, being 22 ft. 6 in. high, and having weighing-platforms 7 ft. high. All the other stories, with the exception of the apartment in the roof, which is set apart for the machinery, being 9 ft. from floor to floor. The granary is built of Cattybrook bricks, over two millions of which have been used, and the floors are supported by iron columns, about 780 being used throughout the building. The weighing-platforms and the first floor are laid in cement, and the other floors are of very stout pitch-pine beams, red deal joists, and pitch-pine boards. Each story is lighted by numerous windows, with Lindsay's patent frames. The granary is expected to be ready for use in June.

Eastbourne.—The Grand Hotel, Eastbourne, has lately been very considerably extended and enlarged. The extension is made at the back of the hotel, in Compton-street (west), and consists of 14 shops, 50 bedrooms, a large entertainment hall, manager's room, telegraph and post-office, billiard-room, and two club-rooms, &c. The total frontage to Compton-street (west) is 255 ft., the ordinary elevation is 60 ft. high, while the centre bay rises to an altitude of 76 ft. The shops are 30 ft. by 15 ft., having cellars beneath, and are intended as lock-up shops. They are cut off from the rooms above by a concrete fireproof floor or ceiling 6 in. thick. The entertainment hall,—which is on the first-floor,—is 36 ft. by 24 ft., with ante-rooms, closets, and separate staircase; the billiard-room is 32 ft. by 22 ft. No. 1 club-room is 22 ft. by 15 ft., and No. 2 club-room, 15 ft. by 12 ft. All these rooms are on the first floor, and are 15 ft. high. There is a new entrance from Compton-street, in the centre of the building, with a flight of marble steps and a corridor 8 ft. wide, which leads directly into the main hall of the hotel. This new corridor will be elaborately decorated with marble columns, and other artistic ornamentation. Some of the new bedrooms are fitted up on the Continental system, as bachelors' rooms, having bed recesses; and others are arranged *en suite*, with baths, lavatories, and other conveniences. There is a new lift from the basement to the top of the new building. There is to be a Turkish bath fitted up on the most modern principles. The drainage (which is thorough) is on the Shone system, and the whole of the new part will be lighted by the electric light and fitted with electric bells. Many of the shops are already taken. It is expected that the whole of these important additions will be completed and ready for use by Easter. These additions will bring up the total accomodation of the hotel to 300 rooms. About sixty Eastbourne workmen are being employed upon the building. The contractors for the works are Messrs. Patman & Fotheringham, Theobald's-road, London; Mr. M. M. Glover, A.R.I.B.A., London, is the architect; Mr. T. W. Barry, also of London, is the architect's representative on the works, and Mr. Hedges is the builders' foreman.——On the 31st ult. the new public Market and Arcade for meat, vegetables, and other stores were opened by the Mayor and Corporation. The total cost of erection is about 6,000*l.* inclusive. The architects are Messrs. Fuller & Oakden, of Eastbourne. The site upon which the building stands immediately adjoins the new Town-hall in Grove-road, and has a frontage to that thoroughfare of about 230 ft. This is occupied by nine shops and the front to the Market Arcade, which is entered through an archway. It consists of ten shops, each having basement and sitting-room over, reached by means of circular iron staircase. At the extremity of the arcade are sliding gates leading into a spacious market hall, which is 120 ft. by 56 ft. wide, having on its west side four fishmonger's and four butcher's shops, the interiors of which are faced with white glazed bricks; also, a superintendent's office. On the east side are seven shops suitable for various trades. The centre portion is occupied by greengrocer's, fruiterer's, and florist's stalls. At the north end are two shops, facing on to a side road, and two entrance-ways, each 10 ft. wide, by means of which goods are brought into market. Conveniences for males and females are provided, and we are told that great care has been taken to provide a good system of ventilation and an ample water supply, so that the market can be cleaned daily. The lighting throughout is by means of electric light, gas also being laid on to the arcade shops. The building is designed in a style to harmonise with the town-hall adjoining, so far as possible, being executed in red brick, with Bath stone dressings. The roof is glazed on Rendle's system, and the floor laid with Hobman's paving.

Leeds.—The buildings which have been erected in Clarendon-road, Leeds, adjoining the St. George's National Schools, as a memorial of the Rev. Charles E. Lamb, formerly vicar of St. George's Church, were formally opened on the 12th inst. The *Leeds Mercury* says that Mr. Lamb, who was for seven years the vicar of the parish, had to relinquish his duties some few months ago on account of failing health. Steps were at once taken by the parishioners to commemorate his name and labours amongst them, and it was eventually decided to erect a "memorial building." This contains, in the basement, a room 32 ft. long by 14 ft. wide, which is to be used as a school of cookery. On the ground-floor there is a boys' class-room, 32 ft. square, and also a lavatory. On the first floor is the parochial room, likewise 32 ft. square, together with a committee-room. The parochial room has a large coved plastered ceiling, having dressed, moulded, and varnished roof bindings; there is a specially-designed stone chimney-piece, on which the initials C. E. L. and the date are carved. The elevation to Clarendon-road is in hammer-dressed stone, having mullioned and transomed windows, with cornices over the entrance. There are moulded elliptical head "lights" above the transome. The work has been carried out under the superintendence of the architects, Messrs. Smith & Tweedale.

Plymouth.—The *Western Morning News* says that the contract for the erection of the Plymouth Borough Asylum, at Blackadon, in the parish of Ugborough, was signed on the 20th inst. by Messrs. Pethick Bros., of Plymouth, the contract amount being 34,544*l.* The buildings will be erected from the designs and under the direction of Messrs. Hine & Odgers, architects, Plymouth, whose drawings and specifications have been approved by the Commissioners in Lunacy. Accommodation will be provided for 200 patients, and there will be residences for the medical superintendent, assistant medical officers, and other officials, a large dining and recreation hall, workshops, a water-tower, farm buildings, gas works, a lodge, and a detached chapel. The asylum will be completed in about two years and a half.

Sanitation in Paris.—Since the discharge of the whole of the sewage has been authorised in Paris, the Hôtel de France and de Bath, Rue St. Honoré, has been the first to have its water-closets, &c., altered, and the drainage completely changed according to the latest improvements. The work has been carried out by Messrs. Doulton & Co., of London, and 6, Rue Paradis, Paris.

CHURCH-BUILDING NEWS.

Coventry.—Last autumn an examination of the spire of Christ Church, Coventry, was made, on instructions given by the incumbent, the Rev. W. Kipling Cox, and the upper portion was found to be in a dangerous condition; so much so, that immediate steps were taken to raise the necessary funds for its restoration. A meeting of the churchwardens of St. Michael's Church was convened to meet the churchwardens of Christ Church in consultation (Christ Church being a chapel-of-ease to the larger sister church, and in the patronage of the vicar), and measures were taken to open a subscription list, which has been in progress during the last few months. The funds have now increased to a very fair amount, and on the 4th inst. another meeting was called to consider the advisability of commencing the work, and it was decided that no time ought to be lost in having a detailed professional report made of the nature of the restorations required. The vicar, incumbent, and churchwardens of both churches, after consideration, appointed Mr. Harry Quick, architect, Coventry, to report and carry out the necessary works of restoration. The scaffolding of the spire will be commenced in a few days. St. Michael's spire is still wreathed in scaffolding, and is not expected to be completed until next year. Last year the spire of Holy Trinity Church underwent restoration, which was most successfully carried out. The tower and spire of Christ Church are the only remains of the old church of the Grey Friars. Attached to this church was a monastery of the order, which, with the greater part of the church, was destroyed at the Dissolution. The present edifice was erected in the year 1772.

Hednesford (Staffordshire).—A few days ago St. Saviour's Mission Church, at Green Heath, was dedicated by the Lord Bishop of Lichfield. The building, which is erected in a scattered district, is a small red brick structure in the Gothic style, the nave being 44 ft. long and 27 ft. wide, and is estimated to seat 210 people. The inside of the building is finished with a red pressed brick dado with moulded brick capping and skirting running round the nave. The walls above the dado are plastered and finished off with moulded plaster cornice picked out in colours. The building is ventilated by means of Ellison's patent tubular inlets, the foul air being drawn through ornamental brass ceiling lights with apparatus to prevent down draughts. The west gable has a circular stained-glass window, and the windows in the porch are also filled with floriated glass. The building has been erected by Mr. Robert Barton, of Hednesford, from plans by Mr. F. W. Evans, of Birmingham, at a cost of 475*l.* It is intended to add a chancel and vestry to the building at some future time.

Innerleithen (Peeblesshire, N.B.).—Estimates have been accepted for the enlargement of the parish church here. The works will provide for upwards of 300 additional sittings (making over 1,000 in all), an open chancel for organ and choir, vestry, &c. The chancel arch and shafts will be of red Dumfries-shire sandstone; the roof, an open timber one, will be almost entirely renewed; and the whole building slated with green Westmoreland peggies. It will be heated with Grundy's hot-air apparatus, and the entire cost will be about 1,900*l.* J. Macintyre Henry, of Edinburgh, is the architect.

Wix (Essex).—The church of St. Mary, Wix, was formerly attached to a Priory of the Benedictine Order, founded, in the reign of Henry I., by Walter the Deacon and Editha his sister, and endowed with ample possessions, which, on the suppression of the monasteries in 1525, were appropriated, with many other similar endowments, for the foundations of Cardinal Wolsey's Colleges at Oxford and Ipswich. The original church having become dilapidated in the course of time, the greater portion was pulled down in 1719, and a plain and unsightly building, with a western gallery and a ceiled roof covered with pantiles erected in its stead. There was no chancel on the north side. Three of the original Early English shafts, capitals, and arches, much mutilated, remained. In adding a chancel the remains of a staircase, evidently leading up to a rood-loft in the east end wall, which was some 4 ft. or more in thickness, was discovered. The works carried out consisted in removing the flat plaster ceiling, and converting the king-post roof into an open-timber roof, with curved braces of a queen-truss, boarded so as to give additional height, an octagonal apsidal chancel, and the insertion of stone windows and mullions instead of the old wooden frames. By re-flooring and reseating the nave, accommodation has been provided for 190 persons in all. The alterations have been carried out under the superintendence of Messrs. Wadmore & Baker, architects, Great St. Helen's, London, by the builder, Mr. Alfred Brown, of Braintree, at a cost of about 900*l.* A new font has been presented by Mrs. Norman, of Mistley-place. The church was re-opened on the 12th instant by Dr. Bloomfield, Suffragan Bishop of Colchester, in the absence, through indisposition, of the Bishop of St. Alban's. We are told that all traces of the older work have been carefully preserved and restored.

STAINED GLASS.

Birley.—The church at Birley, near Leeds, has just received a two-light window from the studios of Messrs. Mayer, of Munich and London. The window is in memory of a verger, the subject selected being from the text, "I had rather be a doorkeeper in the house of my God than dwell in the tents of ungodliness."

Liverpool.—A Liverpool paper states that at the New Church, Bedford-street North, on Easter Sunday, a stained-glass window, the generous gift of Mr. John Henry Bradford, a member of the congregation, in memory of his uncle, the late Mr. John Finnie, was "inaugurated." The subject of the window is the Ascension. It has been executed by Messrs. Norbury, Patterson & Co.

Mossley.—The church of St. George, Mossley, has received a two-light window from the studios of Messrs. Mayer & Co. The subject selected was "Jesus in the house of Martha and Mary."

Shipley.—A stained-glass window of three lights has been placed in the south aisle of Shipley Church, Yorkshire, as a memorial to the late Mr. John Wilkinson. "Christ's charge to His disciples to go forth to preach to all nations" is the chief subject, extending over the whole of the lower lights, and in the tracery is shown the miracles. Messrs. Powell Brothers, of Leeds, are the artists.

The Student's Column.

IRON.

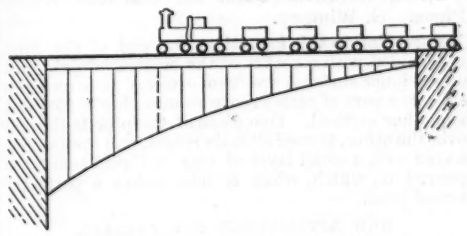
XVII.—MOVING LOADS.

MOVING or travelling loads are usually referred to as "live loads." Their effect upon girders and beams is to produce *sudden* shocks of varying intensity in the different members composing the beam. The fatigue in the material of which a girder is constructed is far greater from a live load, or a load applied *suddenly*, than from the same amount of load when applied, so as to take effect very *gradually*, as is the case when applied as a fixed or dead load. Hence a greater *factor of safety* should be allowed in dealing with the circumstances of a moving load than when dealing with the circumstances of a fixed load. By a factor of safety is meant the number by which the breaking weight, estimated per unit of area, has to be divided, to obtain the unit working load. In this country it is customary to employ the number 4 as a factor of safety, for structures subject to mixed loads. This gives a unit working stress for wrought iron of 4 tons in compression, and 5 tons in tension, one square inch being taken as the unit. The average ultimate strengths per square inch of cast iron may be taken as from 9 to 14 tons (say), 7 tons in tension, 42 tons in compression, and 14 tons shearing stress; of wrought-iron 16 tons in compression, and 22 tons shearing stress. Angle irons, tee irons, and flat bars, up to a width of 6 in. should bear a tensile strain of 22 tons per square inch before fracture, and an elongation of 12 per cent. upon a length of 8 in. Round bars, bolts, and nuts a tensile strain of 23 tons per square inch, with an elongation of 15 per cent. upon a length of 8 in., channel and other sections 21 tons per square inch, with an elongation of 8 per cent. upon the same length, in the direction of the fibre, and 17 tons per square inch, with an elongation of 4 per cent. crossways. In structures where the live load is far in excess of the dead load, an additional margin of safety can be provided by adding a percentage to the live load. Especially is this necessary to be allowed in small railway bridges, and in cases where the effect of the moving load may be considerably increased by high velocity, the obliquity of the piston-rods to the engine, and the plays of the springs of the rolling stock.

In roofs and similar structures, a working stress amounting to 6 or 7 tons is sometimes permitted, but we cannot recommend so high a figure, as it approaches too near to the limit of elasticity to leave sufficient margin for errors of workmanship, and corrosion of the material. The flange stresses at any point in a girder, acted upon by a single concentrated live load, will be at a maximum when the load is directly over the given point, and the maximum flange-stress, which occurs throughout the girder, will be when the load is in the centre of the span. The formula for obtaining the stresses in flanges with a load acting at any point, has already been given in a previous article (*Builder*, March 17th, p. 198), and the stresses at any number of points in the flanges of a girder, acted upon by a rolling load, can be obtained by assuming the load to be over the point, where it is required to know the maximum stress; and making a calculation with the use of the formula before mentioned.

The maximum stresses in the web will occur under the same circumstances as those in the flanges, and can be found by applying the formula given for shearing stresses in a girder loaded in the same way (*Builder*, March 24th, p. 215).

When a girder is acted upon by a uniform rolling load, the maximum stress at any point *in the flanges* will occur when the load completely covers the span, and can then be calculated by the same formula as for a girder subject to a uniform dead load, so that the amounts of the dead and live loads, equally distributed, can be first added together, and the total stress found in one operation.



The maximum stresses *in the web* at any point will occur when the live load covers the distance between the point and the farthest abutment, while the remaining portion is unloaded, and its amount will evidently be equal to the reaction of the nearest abutment. As the load moves forward the shearing stress in front increases as the square of the length of the loaded portion of the girder, and therefore varies as the ordinates of a parabola, and may be represented graphically as shown in the diagram.

RECENT PATENTS.

ABSTRACTS OF SPECIFICATIONS.

6,649, Ventilating Sashes. W. Anderson.

In ventilators, as ordinarily constructed, the glass in opening and closing is sometimes broken by coming in contact with the sash. By this invention T iron is employed, and arranged so that the web of the T is between the sides or ends of the sash and the glass,—the glass being fixed in the quadrant on the other side of the web by putty. A bolt of peculiar form, operated by cords, is employed to fasten the sash, the same cords controlling the opening and closing.

6,990, Water-closets. L. E. Lenster.

According to this invention, in proximity to the pan of the closet a vertical tube is fixed. This tube communicates with the soil-pipe, and into it the said pan directly opens (with or without the intervention of a trap). Within this tube is fitted a sliding plug, which is hollow for a certain portion of its length, and provided with an opening corresponding in size and shape with the opening between the pan and the vertical tube, so that when the openings coincide the contents of the pan are free to flow through the said plug into the soil-pipe. When the solid portion of the plug is placed opposite the communicating opening between the pan and the vertical tube communication between the pan and the soil-pipe is cut off. The plug descends with sufficient force to cut through any obstructions, such as paper, &c., which may adhere round the opening.

14,381, Flushing Cisterns or Water Waste Preventers. B. R. Banks.

This invention relates to a cistern with a float and

valve, which is operated by pulling down a chain or rod which brings the float down a cylinder, and closing the foot-valve, presses the water into the short leg of a syphon, thus starting it, when the pressure of the air on the outside opening, the foot-valve maintains the action of the syphon until the water in the cistern is exhausted, thus ensuring a thorough flush.

883, Ventilating Sewers and Drains. S. H. Adams.

In order to ventilate the drains an air inlet is, by this invention, so placed that the flow of liquid creates a suction which supplies air to the sewer with which it is connected. A trap flap-valve is sometimes added, for the purpose of cutting off the passage of sewer gas in a more effectual manner.

935, Improved Roof Tile. S. Turner.

The mode of construction contemplated by this invention is to form a projection along the tile under the wing, forming with the wing a groove similar in shape to the fillet, and large enough to receive it; this projection is fluted on its top side so as to form a channel to convey the water away. It also projects under the fillet of the next tile, and thus secures it from being blown off. The fillet is curved over outwards forming a small wing, and shaped so as to fit under the wing and into the channel on the projection in the adjacent tile referred to. The wing is shorter at the head end of the tile to a length equal to the required lap, and at the same end of the tile a slice is taken off the upper side of the fillet of equal length to the required lap, and sufficient in size to enable the tile to lap over and bed on them. This construction allows the tiles to be left square at all their corners, so that when they are fixed on the roof there will be five thicknesses of tile lapping each other at the corners, making it specially strong and tight at the weakest part of most other tiles.

2,043, Draught-excluders. W. Davis and J. Crouch.

The doors are, according to this invention, fitted with a series of rollers, which turn independently of each other, but which fall sufficiently low to close the aperture beneath the door.

2,164, Improved Joint for Gas and Water Pipes. G. Wimpey.

According to this invention, one end of the pipe is provided with a socket of the ordinary depth, and on its inner surfaces are two grooves, one on each side, one part of each groove running horizontal and the other vertical. One piece of the pipe is slipped over the other, turned slightly round, and then either keyed with a small layer of clay or liquid cement is poured in, which, when it sets, makes a perfectly sound joint.

NEW APPLICATIONS FOR PATENTS.

April 13.—5,502, C. Wittkowsky, Mosaic Work.—5,509, H. Butcher and J. Baxter, Draught-excluders for Doors and Windows.

April 14.—5,537, W. Creek and C. Ison, Hanging Window-sashes. — 5,540, G. Neilson, Securing Sliding Window-sashes.—5,569, J. Innes, Removing Gum from Saws.—5,571, J. Innes, Setting Saws.

April 16.—5,589, N. Barker, Ladders.—5,615, J. Cheshire, Window and Door Fastener and Alarum.—5,617, G. Barker, Girders.—5,637, G. Nash and P. Lacassagne, Windows.

April 17.—5,667, J. Auger, Opening and Closing Stays for Fanlights, Casement Sashes, and Ventilators.—5,682, C. Jones, Window-sash Fasteners.—5,697, A. Morrison and M. Ingram, Bath and Lavatory Fittings.—5,728, O. Elphick, Water-waste Preventers.

April 18.—5,780, F. Ryan, Sink and Gully Stench Traps.—5,808, A. Ponton, Artificial Marble, Granite, and other Stone.

PROVISIONAL SPECIFICATIONS ACCEPTED.

13,796, W. Hopkins, Hanging or Poising Doors or Movable Partitions.—1,885, R. Sutcliffe, Automatically Unbolting Doors.—2,410, R. Lowe, Combined Scullery Sink Pipe and Trap.—2,843, V. Mehay, Instantaneously Opening Doors and Windows.—3,178, T. Cook, Revolving Sliding Partitions.—3,197, W. Morier, Whitewash and Distemper Brushes.—3,236, H. Whitehouse and J. Clifford, Sash-fasteners.—3,417, J. Cochrane, Flushing Cistern for Preventing Waste of Water in Water-closets.—3,635, S. Wilmot, Galvanised Sheet-iron Roofing.—3,709, P. Ogilvie, Holders or Sustainers for Window-sashes.—3,727, J. Lander, Fireproof Building Construction.—3,729, W. James, Flushing Drains, Water-closets, &c.—4,103, F. Street and C. Ellis, Ventilators.—4,184, W. McCulloch, Water Waste-preventing Cisterns.—4,409, C. Brothers, Hit-and-Miss Ventilators.—4,419, S. Boulton, Preservation of Timber, &c.

COMPLETE SPECIFICATIONS ACCEPTED.

Open to Opposition for Two Months.

4,023, W. Swingler, Charcoal Stove for Removing Old Paint.—8,140, W. Bohm, Stair-treads, Flooring, &c.—9,434, J. Easby, Automatic Apparatus for Dry Closets and Water-closets.—10,114, J. Wallas, Heads of Rain-water Pipes, &c.—15,542, T. Worthington, Ventilating Sewers and Drains.—596, C. Browett, Preventing the Rattling of Windows, Doors, and Shutters.—3,555, C. Barron, Window-sashes.—3,795, F. Coninck, Incombustible Paint.

RECENT SALES OF PROPERTY.

ESTATE EXCHANGE REPORT.

APRIL 16.

By WAGSTAFF & WARMAN.

Holloway—29, Yonge Park, 63 years, ground-rent 8*l.* 10s.	£410
Stepney—19, Belgrave-street, 20 years, ground-rent 1*l.*	260
Holloway, Lowman-road—Ground-rents of 35*l.* 14s., term 76 years	572

By VAUGHAN & Co.

West Hampstead—Ground-rent of 6*l.* 10s., term 118 years	135
Euston-road—Nos. 215, 217, and 221, freehold	3,600

APRIL 17.

By H. RUTLEY.

Regent's Park — 100, William-street, 34 years, ground-rent 7*l.*	420

By G. W. DIXON.

Sutton, Clifton-crescent — The freehold residence called Eastcote	800

By GLOVER & HARRISON.

Brixton—33 and 35, Elm Park, freehold	650
71 and 73, Water-lane, 37 years, ground-rent 11*l.*	750
Lambeth—69 and 71, Trigon-road, 37 years, ground-rent 8*l.*	570

By GREEN & SON (of Hammersmith).

Gunnersbury—13, Arlington Park-gardens, S., freehold	1,030
Shepherd's-bush — 13, Arminger-road, 95 years, ground-rent 6*l.* 6s.	355
Maida Vale—12, Randolph-mews, 61 years, ground-rent 3*l.* 10s.	175

By DEBENHAM, TEWSON, & Co.

Walworth—1 to 17 odd, Dean's-buildings, freehold.	1,810
31 to 43 odd, North-street, freehold	1,720
29, North-street; and 19 and 21, Northampton-places, freehold	660
9 to 17 odd, Northampton-place, freehold	990
5 and 7, Northampton-place; and 1 to 4, Northampton-buildings, freehold	630
2 to 18 even, Dean's-buildings, freehold	1,530
20 to 28 even, Dean's-buildings; and 1 to 7, Dean's-court, freehold	1,390
St. Martin's-lane—Ground-rent of 140*l.*, reversion in 72 years	3,150
Croydon—1 to 8, Cambridge-terrace, freehold	2,800
Fitzroy-square — 102, Cleveland-street, 36 years, ground-rent 12*l.*	500
79, Charlotte-street; and 4, Tottenham-mews, copyhold	2,460
6, Chitty-street, copyhold	700

APRIL 18.

By C. D. FIELD & SONS.

Bermondsey—14, West-street, 26 years, ground-rent 3*l.*	200
Swan Mead, leasehold factory premises, term 25 years, at 70*l.*, and 23 years at 90*l.* per annum, including plant and machinery	650

By BARKER & NEALE.

Norwood — Ground-rent of 24*l.*, reversion in 48 years	560

By DOWSETT & Co.

Weston-super-Mare—The Lodge, and 15a. 3r. 6p.	8,200
Island of Achill—The Tanatanvalley Estate of 2,218 acres	650

By CHESTERTON & SON.

Kensington—63, Palace Gardens-terrace, 69 years, ground-rent 10*l.*	670
Hyde Park—3a, 4a, and 6a, Porchester-mews, 50 years, ground-rent 17*l.*	1,160
4, 5, 7, to 10, Leinster-street, 50 years, ground-rent 20*l.*	3,550
Kensington—27 to 33 odd, Warwick-gardens, 60 years, ground-rent 16*l.*	5,380
An improved ground-rent of 4*l.*, term 58 years	130

APRIL 19.

By DYER, SON, & HILTON.

Blackheath—11 and 13, Shooter's Hill-road, 32 years, ground-rent 24*l.*	915

By W. R. NORRIS.

Brunswick-square—31, Wakefield-street, 13 years, ground-rent 4*l.*	210

By R. J. COLLIER.

Hackney—117, Clarence-road, freehold	475
Dalston—78, Mayfield-road, 65 years, ground-rent 6*l.* 5s.	400
17 and 19, Richmond-road; and 52, Holly-street, 35 years, ground-rent 30*l.*	160

By NEWSON & HARDING.

Dalston—55, Graham-road, 64 years, ground-rent 5*l.*	380
Islington—61, Elmore-street, 39 years, ground-rent 11*l.*	400
Holloway—69, Carleton-road, 81 years, 7*l.* 10s.	540
Brixton—31, 32, and 34, Holland-road North, 26 years, ground-rent 15*l.* 15s.	480
East Finchley, Baronsmead-road—The residence called Claremont, 95 years, ground-rent 6*l.*	425

APRIL 20.

By ROBERT REID.

Regent-street—13, 13a, and 13b, Great Marlborough-street; 1, Ramilies-street; 2, Blenheim-mews, and the Blenheim Arms public-house, area 9,166 square feet, freehold	13,560
Upper Holloway—683, Holloway-road, freehold	2,030

By GREEN & SON.

Upper Teddington, Stanley-terrace — Freehold ground-rent of 30*l.* per annum	660

By PROTHEROE & MORRIS.

Penge, Anerley-road—A piece of freehold land, with erections thereon	820

By TOWERS, WILLIAMSON, & ELLIS.

Regent's Park—2, 3, and 4, Taunton-place, 21 years, ground-rent 21*l.* 15s.	1,020

Glasgow International Exhibition.—By all accounts, everything seems to be going well with the preparations for the opening of the International Exhibition at Glasgow on the 8th of May, and there seems to be a good prospect of something like completeness of arrangement by that date.

MEETINGS.

MONDAY, APRIL 30.

Society of Arts (Cantor Lectures).—Mr. G. Aitchison, A.R.A., on "Decoration." I. 8 p.m.

Surveyors' Institution.—Mr. J. W. Willis Bund on "The Land Transfer Bill, 1888," now before Parliament. 8 p.m.

Leeds and Yorkshire Architectural Society.—(1) Secretary's Report. (2) Election of Officers. (3) Members' *Soirée*. 7 30 p.m.

TUESDAY, MAY 1.

Art Union of London.—Annual Meeting and Prize Distribution, Adelphi Theatre. 12 noon.

Institution of Civil Engineers.—Further Discussion on Mr. E. B. Ellington's paper on "The Distribution of Hydraulic Power in London." 8 p.m.

Parkes Museum (Lectures for Sanitary Inspectors).—Mr. Charles E. Cassal, F.C.S., on "Food (including Milk), Sale of Food and Drugs Act." 8 p.m.

Royal Institution.—Annual General Meeting. 1·30 p.m.

Society of Biblical Archæology.—The Rev. A. Löwy on "Old Jewish Legends on Biblical Topics" and "Legendary Descriptions of Hell." 8 p.m.

WEDNESDAY, MAY 2.

Society of Arts.—Mr. T. R. Ablett on "Drawing, a means of Education." 8 p.m.

Builders' Foremen and Clerks of Works' Institution.—8·30 p.m.

THURSDAY, MAY 3.

Parkes Museum. — Professor T. Hayter Lewis on "Ancient and Mediæval Towns." 5 p.m.

Royal Archæological Institute. — (1) Mr. J. Hilton, F.S.A., "Some Remarks on Jade." (2) Messrs. J. C. and C. A. Buckles on "St. Mary's Church, Melbury Bubb, Dorset." 4 p.m.

Institution of Mechanical Engineers.—General Meeting. Papers: (1) "Third Report of the Research Committee on Friction: Experiments on the Friction of a Collar Bearing." (2) Mr. H. R. Towne on "Description of the Emery Testing Machine." (3) Mr. T. Urquhart on "The Use of Petroleum Refuse as Fuel in Locomotive Engines." 7·30 p.m.

Society of Antiquaries.—8·30 p.m.

Edinburgh Architectural Association.—Mr. G. Goudie on "The Broughs or Circular Towers of Celtic Scotland." 8 p.m.

FRIDAY, MAY 4.

Architectural Association. — Mr. H. H. Statham on "Cornices and String Courses." 7·30 p.m.

Institution of Mechanical Engineers. — General Meeting continued. 2·30 p.m. Anniversary Dinner in the evening.

Society of Arts (Indian Section). — Surgeon-General H. W. Bellew on "The Injurious Effects of Canal Irrigation on the Health of the Population of the Punjab." 8 p.m.

Parkes Museum (Lectures for Sanitary Inspectors).—Mr. Shirley F. Murphy, M.R.C.S., on "Infectious Diseases and Methods of Disinfection." 8 p.m.

SATURDAY, MAY 5.

Architectural Association.—Visit to Beaumont College. (See advt. on first page).

Association of Public Sanitary Inspectors.—Annual Address of the President, Mr. Edwin Chadwick, C.B. 6 p.m.

Edinburgh Architectural Association.—Visit to Elie, Elie House, and Kellie Castle, St. Monance Church, and Old Castle near.

Miscellanea.

New Public Hall at Isleworth.—On the 12th inst., the new public hall at Isleworth, erected as a memorial of the Jubilee of Queen Victoria's reign, was publicly opened. It has been erected from the plans and under the superintendence of Mr. S. Woodbridge, jun., architect, Brentford, on a site at the rear of the Free Library. The outbuildings of the library, in which were the retiring-rooms and librarian's room, have been pulled down, and a caretaker's private room, to communicate with the new building and with the library, substituted, this being situated between the two. On the ground-floor is a committee-room, 19 ft. 3 in. by 29 ft. 3 in., likewise a smoking and billiard-room of similar dimensions, and a separate retiring-room and cloak-room for ladies and gentlemen leading out of the end room, and space is reserved for separate performers' rooms (to be divided off at some future time, if so desired), with sufficient space for lavatories, &c., for lady and gentlemen performers. The committee-rooms are approached by separate entrances from the open, and a space of 10 ft. or 12 ft. is left between the main wall of the front hall and the wall of the adjoining premises to admit of a lean-to roof being added hereafter, if necessary, to form a corridor, in continuation of the hall of the present reading room. At the end of this space is a staircase, 4 ft. 6 in. wide, for approach to the reserved seats of the hall. The public entrances from the front are through the library building to the above-mentioned staircase from the private road on the north side by a similar staircase to the back of the hall, thus keeping the entrances to the reserved and back seats entirely separate. The hall itself is 58 ft. long by 31 ft. wide, exclusive of the platform, which is 12 ft. from wall to front of stage, thus making the size of the hall from end to end 70 ft. long. The cost of the hall has been about 1,500*l.* Mr. Dorey, of Brentford, is the builder.

Edinburgh Architectural Association. A party of about fifty members of the Edinburgh Architectural Association, headed by their president, Mr. Hippolyte J. Blanc, paid, on Saturday last, a visit to the Forth Bridge works, over which they were conducted by Mr. Cooper, the resident engineer. The party first visited the drawing-office, where the plans of the bridge were exhibited, and where they had an opportunity of seeing how carefully the minutest details of the structure are thought out beforehand. From the drawing-office they proceeded to the pattern-room, and there, by means of a model, Mr. Cooper explained the principle of the cantilever, which he compared to a man standing with his arms stretched out. He showed the distribution of the stresses throughout the structure, and how they were ultimately brought to bear on the upright member of the cantilever, which, in the case of the Forth Bridge, had to bear a strain of something like 6,000 tons. He explained how the tubular form of the cantilever members, and of the main struts and ties, while giving the greatest strength in proportion to the material used, afforded at the same time the least surface for wind-pressure. Lateral resistance to wind-pressure was also increased, he explained, by the inclination towards one another of the cantilever members in the longitudinal plane. A good deal of attention was given to models showing how provision has been made for the expansion and contraction of the bridge by the variations of the seasons, and for the deflection produced by lateral wind-pressure. Attention was given to the moulding machines, by which the immense steel plates used in the construction of the tubular members receive at one process the required curvature, and to the planing and drilling machines. In the yards the portions of the structure were seen fitted together on trial before being taken down to occupy their permanent place on the bridge. The party afterwards visited the bridge itself, and Mr. Cooper accompanied them over the South Queensferry cantilever. The work being stopped, the visitors had the fullest freedom in examining the structure. Most of them, by means of the elevator, paid a visit to the top of the cantilever columns, 350 ft. above high-water mark. A number of them accompanied Mr. Cooper to the extremity of one of the lower cantilever members, which has been built out to a distance of 220 ft., and had explained to them the process by which the plates are fastened to a diaphragm of the column, each part as it is finished being made the basis for a fresh advance. At the close of the visit Mr. Blanc, in name of the members, very cordially thanked Mr. Cooper for his courtesy. A subscription amounting to 2*l.* 11s. was made towards the workmen's Sick and Accident Fund.—*Scotsman.*

The Cost of Melting Snow.—The experiment of melting snow by steam was tried at New York after the recent snowstorm, but it does not seem to have answered very well. Many persons were more or less successful, by running temporary pipes from their boilers into the snow banks, or into large boxes, into which the snow was shovelled. The emergency justified such an expensive expedient; but it should not be imagined that this method of removing snow could be generally adopted. To melt a pound of snow or ice takes as much heat as would raise the same weight of water from the ordinary temperature of 70° to boiling-point. Removing snow by melting in various ways has been frequently proposed. For instance, snow has been thrown down sewer manholes, and there melted on iron plates kept hot by gas jets. This plan, however, has also been found impracticable, for, to melt by gas snow from a mile of ordinary street after a fall equal to 3 in. of rain, about equal to that of the late New York blizzard, would require the consumption of about 100 tons of gas coal, provided all the heat was utilised; practically, it would take a great deal more.—*Iron.*

"Carbo-Dynamite."—This is the name of a new explosive (Borland's patent), of which some trials were made last week at Treherbert, Rhondda Valley, South Wales, when several experiments were carried out by Mr. W. F. Reid. The results seem to prove (1) that the power of the new explosive as a blasting agent is greater than that of ordinary dynamite; (2) that after being immersed in water for a considerable time it does not exude; and (3) the non-existence of noxious fumes after explosion.

British Archæological Association.—A meeting of this Association was held on April 18th, Mr. George R. Wright, F.S.A., in the chair. The arrangements for the proposed excavation of the site of the ancient chapel of St. Germanus, at St. Alban's, were referred to, and it was announced that the work would soon be begun, under the direction on the spot of Mr. J. Harris, C.E. It was announced that the Broch at Clickimin, N.B., has recently been wantonly injured by a local builder requiring stone for building purposes, but the Ancient Monuments Act being promptly set in motion, the builder has been fined and the purloining of stone stopped. The circumstances were detailed, and the action taken was specially commended. Mr. Loftus Brock., F.S.A., described a series of curious French jettons of seventeenth-century date, illustrating the use as counters of these curious objects. Mr. Oliver exhibited a collection of pottery, for the most part recently found in London, the most curious being a jug of the sixteenth century, found at St. Giles's. Mr. R. Mann exhibited a series of drawings of the fine Roman villa recently discovered at Tockington, Gloucestershire, not far from the course of the old Roman road up to the Severn at Old Passage. The site is within the area of a modern-looking farmhouse, and the remains have been found at a depth of only a few inches beneath the modern level. Five tesselated pavements have been already more or less uncovered, and their designs are of great beauty.* The walling shows that a large portion of the villa had been reconstructed at a different axis to the older work, and there are many indications that the site has been occupied, perhaps, from Roman times to the present day. The farm-house on examination shows many signs of early work. In Mr. Mann's absence the paper was read by Mr. de Gray Birch, F.S.A. The Dowager Marchioness of Huntley exhibit a large prehistoric flint implement picked up by her Ladyship on the opening of a gravel pit on her estate at Orton Longueville, in 1887. A paper prepared by Mr. J. T. Irvine was then read in his absence by Mr. Howlett on the position where the flint was found. The excavation reveals the curious fact that a trench had formerly existed along its course, and it had evidently been filled up with gravel in prehistoric times, there being no depression to mark its course on the modern surface. It was suggested that the flint implement had been used as one of the teeth of an ancient harrow. The Rev. Mr. Royston exhibited a somewhat similar object of red earthenware found at Whittlesea.

Underhay's Patent Screw Bolt Fastener. This is an invention recently patented by Mr. F. G. Underhay, of Crawford-passage, Clerkenwell, whose name is so well known in connexion with sanitary apparatus. It consists of a screw-bolt and nut, to be used instead of a padlock, for securing the doors of warehouses, stables, and other buildings which have to be fastened from the outside. It is also, of course, applicable for use in securing the doors of railway and road vans. The hinged bar and the eye or staple form no part of the patent, and may be of any ordinary pattern, provided they be sufficiently strong. The invention essentially consists of the screw-bolt and nut, which are substituted for the padlock. The screw-bolt and nut are of gun-metal, the bolt-head being elongated from back to front, with the back surface straight, so as to abut close against the hinged bar when the bolt is inserted through the eye of the staple. The bolt is quick-threaded, and on one side is a hollow or recess, the use of which is hereafter explained. The nut is circular, and of gun-metal, and contains within its substance an ingeniously contrived and disposed lock, secured by a small key. When the nut has been screwed up tight, or to a point where a nick on it coincides with a nick on the bolt-head, the key can be turned, and it shoots the bolt of the lock into the hollow or recess formed on the side of the screw-bolt, already described. This effectually prevents the unscrewing or removal of the nut, which cannot be removed by any one who has not the key of the lock. The locks are made by Messrs. Hobbs, Hart, & Co., of Cheapside. No two can be opened by the same key. This new invention seems to promise much greater security than is afforded by the use of padlocks, however good and strong.

* Of some of these we have lately given sketches.

The "Chain Pier," Brighton.—One of the most interesting landmarks of Brighton, the Chain Pier, is threatened with extinction, as is mentioned in a paragraph headed "Brighton," in our "Provincial News" this week. The *Daily News* says that of late years the pier has suffered by the competition offered by its newer and larger rival, and by the westward course of fashion, but at one time it enjoyed a monopoly of patronage, and was almost as favourite and as fashionable a resort as the Steine was in the days of the Regency. Thackeray mentions more than once in his letters how he used to go on the pier in a bath-chair to recuperate when he came down to Brighton fagged out. This was in 1849. Six years earlier the pier (at that time used for a packet service between Brighton and Dieppe, before the Newhaven route was developed) was the scene of an event of special interest, inasmuch as Queen Victoria started thence on her first journey out of England, and went to visit Louis Philippe, King of the French. At this time the Princess Royal (now the Empress of Germany), the Prince of Wales, and the late Princess Alice were staying in Brighton at the Royal Pavilion, and the Queen, on her return from the Continent, landed from the Royal yacht at the Chain Pier, and accompanied by the Prince de Joinville, paid another visit to Brighton. In September of the same year she embarked from the Chain Pier to visit the King and Queen of the Belgians. These were the palmy times of the pier, which had then been open about twenty years, having been completed, at a cost of 30,000*l.*, in 1829, from plans by Captain Samuel Browne. The graceful curves of the suspensory chains, and the blackened timbers which support the four towers and the deck at the head, are familiar enough to Brighton visitors, and the structure has compared more than favourably, in picturesque appearance, with pleasure piers of later date. When erected, it was regarded not only as a thing of beauty but as a triumph of engineering skill, and it certainly stood the test of time and the buffets of the waves in a manner at once satisfactory and remarkable. Twice, however, it seemed to have reached a crisis, as it was severely damaged in November, 1836, and again in October, 1838, on one occasion being cut asunder by a tremendous storm, but, being repaired, it has since sustained unharmed the shocks of the severest tempests.

Society of Antiquaries of Scotland.—The concluding meeting of this Society for the present session was held on Monday evening last,—Sheriff Macpherson, vice-president, in the chair. The first communication was a continuation by Dr. Christison of a paper given two years ago, "On the Iron Yetts of Scottish Castles and Towers," of which he said a large number had been brought under his notice since the date of his first paper, which contained twenty-four examples. To these he now added twenty, making a total of forty-four. After describing the peculiar construction of these yetts, illustrated by a model sent by the Rev. Dr. Joass, to whom he expressed his indebtedness for photographs and notices of several examples previously unknown to him, the author proceeded to notice their variations in size, their methods of hingeing and bolting, and the wooden doors that were associated with them. He described in detail the most notable of the twenty additional examples, referring to the large double-leaved one at Doune Castle, which was the only instance known to him of a yett being used along with a portcullis; one at Balveny, also with two leaves; one at Cawdor Castle, said to have been brought from Lochindorb; and one at Eilan Donan, which, curiously enough, was fished up out of the well of the castle, into which it seemed to have been thrown with some curious pieces of artillery after the battle of Glenshiel. Referring to the historic notices of yetts, which were few, he concluded that most castles must have possessed them from the fourteenth century. Dr. Anderson gave in a series of reports by himself and his assistant, Mr. George F. Black, on the archæological and ethnographical departments of the various local museums in Scotland visited under Dr. Gunning's jubilee gift to the Society for that purpose.

Wrought-Iron Casements.—Messrs. Burt & Potts have sent us their illustrated catalogue of wrought-iron casements and frames. The sections seem well calculated to ensure that the windows should be weathertight and serviceable.

The Architectural Association: Proposed Excursion to Ireland.—We have received from Mr. John L. Robinson, of Dublin, the programme of the proposed excursion of some of the members of this Association to Ireland during Whitsun week. Mr. Thomas Drew, R.H.A., will generally conduct the excursion, and several of the buildings to be visited will be described by him. Members taking part in the excursion must arrive in Dublin before Monday, May 20. On that day, after breakfast at 6·30 a.m., they will leave Dublin at 7·40 a.m. for Kilkenny (Castle, Cathedral, &c.); and on Tuesday, May 21st, the party will leave Kilkenny at 9 a.m. for Kilree (round tower), Kells Abbey, returning to Dublin the same evening. Wednesday, May 22nd, will be a Dublin day. Visits will be paid to Christchurch Cathedral, St. Audoen's Church, and St. Patrick's Cathedral (the last-named building will be described by Mr. J. F. Fuller, F.S.A.). On Thursday, May 23rd, the excursionists will leave Dublin at 9 a.m. for Drogheda, Monasterboice (round towers and crosses), and Mellifont (abbey, &c.), returning to Dublin the same evening. On Friday, May 24th, they will leave Dublin at 9·10 a.m. for Trim (castle, abbey, &c.) and Bective Abbey, returning to Dublin in the evening. On Saturday, May 25th, they will leave Dublin at 9·15 a.m. for Malahide (castle and church), returning to Dublin for luncheon at 3 p.m. After luncheon, the remains of the city walls, and the Royal Hospital, Kilmainham, will be visited. In connexion with this excursion, it is mentioned that on Sunday, May 19th, a party will visit the seven churches at Glendalough, leaving Dublin by the 9 a.m. train from Harcourt-street to Rathdrum, dining at Glendalough, and returning to Dublin about 10 p.m. The estimate of expense per member of the party for the whole week of the excursion is put at a little over 8*l*. Mr. J. L. Robinson, A.R.H.A., of 198, Great Brunswick-street, Dublin, will furnish further information on the subject.

New Baths and Washhouses, Lancaster-road, Notting Hill.—This large block of buildings was opened on the 19th instant by Dr. R. T. Daniell, the Chairman of the Commissioners. The building, designed by and carried out under the direction of Mr. Thomas Verity, F.R.I.B.A., is in the style of the French Renaissance. The accommodation provided includes three large swimming-baths, seventy-four private baths, a large public laundry, a house laundry, and the necessary offices, waiting-rooms, lavatories, &c. The total cost of the buildings and of the engineering work, carried out by Messrs. Kirk & Randall, of Woolwich, together with the cost of the site, is upwards of 51,000*l*. The builders' foreman was Mr. B. J. Pyle.

Salisbury Estate, Strand.—We understand that great alterations will shortly be made in the immediate neighbourhood of the Strand, as the whole of the houses comprising Salisbury-street and Cecil-street are about to be pulled down, and the site laid out for the erection of several blocks of large buildings, including hotels facing the Embankment, one or more theatres, and clubs. The estate seems to be especially well adapted for theatres, as it allows of their being built with entrances and exits all round, as well as on two levels—viz., that of the Strand and of the Embankment. Messrs. Perry & Reed, of the Adelphi, have prepared designs for the new buildings, and Messrs. J. W. Hobbs & Co. are the contractors.

The Castles of the Late King of Bavaria. A work which, no doubt, will prove highly interesting to architects even outside Germany, will shortly appear at Leipsig. It is entitled "Die Königsphantasieen. Eine Wanderung zu den Schlössern Königs Ludwig II. von Baiern," edited by Herr Menells. It will be accompanied by 200 plates, woodcuts, &c., illustrating the famous castles built by the late king. It is published by the well-known Artistiche & Literarische Gerellschaft.

Erratum.—The name of the author of two sketches in Venice, in our last issue, should have been given W. Medlycott Duke, not "Tuke." The error arose from "D" being incompletely formed in the signature on the drawing, or not coming out clear on the lithograph.

The Iron and Steel Institute. — The annual meeting of this Institute has been fixed to take place in London on the 9th and 10th of May.

The Working Lads' Institute, Whitechapel.—On Saturday, the 21st inst., the new lecture-hall of the Working Lads' Institute, Whitechapel, was opened by H.R.H. Princess Christian. The front portion of the Institute was opened by H.R.H. the Princess of Wales in October, 1885. Since then, 1,750 members have been admitted. The second section, which has recently been completed, comprises a large swimming-bath, lined with glazed tiles, and a lecture-hall for about 600 persons, with retiring rooms, &c. There is accommodation for 1,000 lads. Each member pays a small subscription, which entitles him to use the gymnasium, reading-rooms, library, &c., also to attend evening classes and lectures. There is also a refreshment-room, and forty beds. The lecture-hall has three stained-glass windows illustrative of Art, Religion, and Industry, and nine semi-circular ceiling lights of stained glass illustrative of the Seasons, and of various sports. These are the gift of the founder and hon. secretary, Mr. Henry Hill, and have been designed and executed by Messrs. A. O. Hemming & Co., of Margaret-street, Cavendish-square, W. The buildings have been carried out at a cost of about 12,500*l*., from the designs and under the superintendence of Mr. George Baines, architect, Great Winchester-street.

Grand Stand, Cardiff.—The *Western Mail* describes the new grand stand which has just been erected on the race-course. It is in three stages, and is built of iron and wood. It is 80 ft. long, 30 ft. deep, and 50 ft. high. Accommodation is provided for 3,000 persons. In the rear are weighing and dressing rooms, and horse-boxes. The whole structure, which has cost about 2,000*l*., is "semi-portable,"—that is, it can be taken down and rebuilt elsewhere if necessary. It is stated that the whole of the work has been designed and carried out by the St. Pancras Ironwork Company, under the superintendence of their representative, Mr. A. F. Jones, within the short period of two months.

Fire Protection at Theatres.—We understand that steps are being taken at the Royal Music-hall, High Holborn, for the better safety of the lives of the public in the case of panic or outbreak of fire in that establishment. Besides the fire appliances already fixed in the building, the lessees have deemed it necessary to improve on the whole of the exit doors in the different parts of the premises, and Messrs. Joseph Kay & Sons, the well-known lock-makers, have been commissioned to carry out the work. The doors have been thoroughly approved by the Board of Trade. They require no one in attendance to open them in case of panic or alarm of fire, as any crush from the inside will cause them to fly open.

Girder Works, Cubitt Town.—Messrs. Charles Williams & Co. write to say that a report is being circulated to the effect that their Girder Works at Cubitt Town are closed. They ask us to allow them to contradict it.

PRICES CURRENT OF MATERIALS.

TIMBER.	£.	s.	d.	£.	s.	d.
Greenheart, B.G. ....ton	6	10	0	7	15	0
Teak, E.I. ....load	8	0	0	12	10	0
Sequoia, U.S. ....foot cube	0	2	3	0	3	0
Birch, Canada ....load	2	15	0	4	15	0
Fir, Dantsic, &c.	2	0	0	4	0	0
Oak ,, ...	2	0	0	4	10	0
Canada	4	0	0	6	10	0
Pine, Canada red	2	10	0	3	10	0
,, yellow	2	10	0	4	0	0
Lath, Dantsic ....fathom	3	10	0	5	0	0
St. Petersburg	5	0	0	6	0	0
Wainscot, Odessa, crown	2	10	0	3	0	0
Deals, Finland, 2nd and 1st...std.	8	0	0	9	10	0
,, 4th and 3rd	6	10	0	7	10	0
Riga	6	0	0	7	10	0
St. Petersburg, 1st yellow	9	10	0	14	10	0
,, 2nd ,, ...	8	0	0	9	0	0
,, white	7	0	0	10	0	0
Swedish	7	0	0	15	10	0
White Sea	8	0	0	17	0	0
Canada, Pine, 1st	16	0	0	24	0	0
,, ,, 2nd	10	0	0	15	10	0
,, ,, 3rd, &c.	7	0	0	9	10	0
,, Spruce, 1st	8	0	0	9	10	0
,, ,, 3rd and 2nd	6	0	0	7	10	0
New Brunswick, &c.	6	10	0	7	5	0
Battens, all kinds	4	10	0	11	0	0
Flooring Boards, sq., 1 in., prepared, First	0	10	0	0	12	0
Second	0	7	0	0	9	6
Other qualities	0	4	6	0	6	6
Cedar, Cuba ....foot	0	0	3½	0	0	4
Honduras, &c.	0	0	3½	0	0	3½
Australian	0	0	2½	0	0	3½
Mahogany, Cuba	0	0	4½	0	0	7
St. Domingo, cargo average	0	0	4½	0	0	6
Mexican ,, ...	0	0	4	0	0	4½
Tobasco ,, ...	0	0	4½	0	0	5½
Honduras ,, ...	0	0	4½	0	0	5½
Rose, Rio ....ton	8	0	0	11	0	0
Box, Turkey	5	0	0	12	0	0
Walnut, Italian ....foot	0	0	4	0	0	5½

METALS.	£.	s.	d.	£.	s.	d.
IRON—Bar, Welsh, in London...ton	4	17	6	5	5	0
,, ,, at works in Wales ...	4	10	0	4	15	0
,, Staffordshire, London	5	10	0	7	0	0
COPPER—						
British, cake and ingot ....ton	81	0	0	0	0	0
Best selected	82	0	0	0	0	0
Sheets, strong	88	0	0	0	0	0
Chili, bars	80	7	6	81	1	6
YELLOW METAL....lb.	0	0	7½	0	0	7½
LEAD—						
Pig, Spanish ....ton	14	0	0	0	0	0
English, common brands....	14	5	0	0	0	0
Sheet, English	15	5	0	15	10	0
SPELTER—						
Silesian, special ....ton	18	0	0	18	5	0
Ordinary brands....	17	10	0	0	0	0
TIN—						
Banca ....ton	165	0	0	0	0	0
Billiton	162	0	0	0	0	0
Straits	166	0	0	0	0	0
Australian	166	0	0	0	0	0
English ingots	153	0	0	0	0	0
,, bars	154	0	0	0	0	0
,, refined, in blocks	159	0	0	0	0	0
ZINC—						
English sheet ....ton	22	0	0	22	10	0

OILS.						
Linseed ....ton	18	12	6	18	15	0
Cocoanut, Cochin	27	0	0	28	0	0
Ceylon	24	0	0	0	0	0
Palm, Lago	21	0	0	21	10	0
Rapeseed, English pale	24	10	0	0	0	0
,, brown	23	0	0	0	0	0
Cottonseed, refined	21	0	0	0	0	0
Tallow and Oleine	25	0	0	45	0	0
Lubricating, U.S.	5	0	0	6	0	0
,, refined	5	0	0	12	0	0
TURPENTINE—						
American, in casks ....cwt.	1	8	6	0	0	0
TAR—						
Stockholm ....barrel	0	15	0	0	15	6
Archangel	0	10	0	0	10	6

TENDERS.

[Communications for insertion under this heading must reach us *not later than* 12 *Noon on Thursdays.*]

BELLAGGIO (Surrey).—For the erection of a bungalow, at St. Margaret's-avenue, Bellaggio, near East Grinstead, Surrey, for Mr. L. C. Biggs. Mr. Walter J. Ebbetts, architect, 115, Strand:—

H. Baylis (accepted)	£317 0 0

BELLAGGIO.—For the erection of a bungalow, according to design 1a, on plot No. 326, near Upper Front Lake, Bellaggio, near East Grinstead, Surrey, for Mr. George Wood. Mr. Walter J. Ebbetts, architect, 115, Strand:—

H. Baylis (accepted)	£246 2 0

BIRMINGHAM. — For alterations and additions to the Aston Brewery, for Messrs. Jos. Ansell & Sons. Messrs. Inskipp & Mackenzie, architects, 5, Bedford-row, London, W. Quantities by Messrs. R. L. Curtis & Sons:—

For First Portion of Works.

Bennett, Lozells	£5,150 0 0
Simons, Aston	5,125 0 0
Moorhouse, Aston	4,997 0 0
Harley & Son, Smethwick	4,950 0 0
Lee & Son, Birmingham	4,930 0 0
Bloore, Aston	4,895 0 0
Jeffery & Son, Birmingham	4,870 0 0
Bowen, Balsall Heath	4,857 0 0
Barnsley & Sons, Birmingham	4,826 0 0
F. N. Stevens, Aston	4,694 7 0
Robinson, Birmingham	4,666 0 0
Johnson, Birmingham	4,630 0 0
Surman & Sons, Birmingham	4,555 0 0
W. & J. Webb, Hockley (accepted).	4,538 0 0

BRACKLEY (Northants). — For the erection of a minister's house. Mr. J. Timms, surveyor, Banbury:—

Hopcraft, Deddington	£798 10 0
Page, Banbury	673 0 0
Hawkins, Brackley	664 0 0
Orchard & Sons, Banbury	645 0 0
Claridge, Banbury	594 0 0
Grant, Banbury	542 0 0
Watts & Sons, Helmdon (accepted) ...	500 0 0

BROMLEY (Middlesex).—For internal and external painting and other work, at the Poplar and Stepney Sick Asylum, Devons-road, Bromley, E., for the Managers. Messrs. A. & C. Harston, architects, 15, Leadenhall-street, E.C. Quantities not supplied:—

J. Holland	£1,341 0 0
J. Wright	1,250 0 0
W. Wythe	1,230 0 0
Vigor	1,119 0 0
Dudley	1,097 9 0
Hoe Bros.	977 0 0
Stevenson & Co.	895 0 0
W. Lilly, Pall Mall (accepted)	857 0 0

CARDIFF.—For erecting warehouse and shop, West Bute-street, for Mr. W. H. M. Tucker, the concrete floors, roof, and stairs being constructed by Messrs. Homan & Rodgers, Manchester and London, for 947*l*. 17s. 11d. Quantities by the architect, Mr. F. Baldwin, 17, Church-street, Cardiff:

	Stone Pilasters.		Brick Pilasters.	
W. Thomas & Co. ...	£1,797	7	£1,785	11 0
L. Purnell	1,792	0	1,768	0 0
Jones Bros.	1,770	0	1,740	0 0
H. Gibbon	1,719	0	1,714	0 0
J. Hallett	1,675	0	1,662	5 0
G. Smalbridge	1,602	0	1,578	0 0
D. J. Davies	1,600	0	1,567	0 0
T. Gough	1,548	0	1,531	0 0
Turner & Sons	1,477	0	1,459	19 6
W. Symonds	1,474	0	1,448	9 3
Shepton & Son	1,451	0	1,431	5 0*

* Accepted.

[All of Cardiff].

COMPETITIONS, CONTRACTS, & PUBLIC APPOINTMENTS.

Epitome of Advertisements in this Number.

COMPETITIONS.

Nature of Work.	By whom required.	Premium.	Designs to be delivered.	Page.
Schools, Boarding House, &c., Coventry	Trustees, Bablake B. C.	50*l.* and 25*l.*	May 29th	ii.
School Buildings, Bishopwearmouth	Sunderland School Bd.	50*l.* and 20*l.*	June 1st	ii.
Plans for Main Intercepting Sewer, &c.	Otley-in-Wharfedale L B	100 guineas	August 1st	ii.

CONTRACTS.

Nature of Work, or Materials.	By whom required.	Architect, Surveyor, or Engineer.	Tenders to be delivered.	Page.
Repairing and Painting Works, Victoria Park	Met. Board of Works...	*Official*	May 1st	ii.
Road Materials, Victoria Park Wharf	do.	do.	do.	viii.
Extension of Laundry, Enfield Workhouse	Edmonton Union	T. E. Knightley	do.	ii.
Post-Mortem Room, &c.	Chelsea Guardians	A. & C. Harston	May 2nd	ii.
Boundary-Wall to Burial Ground	Chiswick Local Board...	A. Ramsden	do.	viii.
Tar-Paving, Kerbing, and Channelling	Hastings Highway Bd.	J. Byner	May 5th	ii.
Six Shops and Alterations, &c., Brompton		F. Stocker	May 7th	ix.
Pipe-Sewers, &c.	Bermondsey Vestry	G. Elkington	do.	ii.
Repairing and Re-gravelling Roads	St. Giles's, Camberwell, Burial Board	*Official*	do.	ii.
Making-up and Paving Roads	Wandsworth Bd. of Wks	do.	May 8th	viii.
Kentish Rag Tar Paving	Southend Local Board...	P. Dodd	do.	viii.
Pipe-Laying, Approach-road, & Gauge House	Northwich Local Board	H. Bancroft	May 9th	viii.
Road-Making and Paving Works	Hammersmith Vestry...	*Official*	do.	viii.
Blue Guernsey Granite Spalls	West Ham Union	do.	do.	viii.
Footbridge	Brighton Town Council	P. C. Lockwood	May 10th	viii.
Engine, Pumps, &c., for Waterworks	Uxbridge Local Board	G. Eves	May 11th	viii.
Deepening Well, &c.	do.	do.	do.	viii.
Police-Station and Court-House, Tisbury	County of Wilts	C. S. Adye	May 12th	viii.
Construction of Aqueduct	Manchester Watrwks C.	G. H. Hill	May 15th	ii.
Paving Works	St. George the Martyr, Southwark	*Official*	do.	ix.
Broken Guernsey Granite	Chelmsford Local Brd.	do.	May 16th	ii.
Hoardings, &c.	Met. Board of Works...	do.	May 17th	viii.
Assembly Rooms, Surbiton		A. Mason	May 19th	viii.
Main Drainage Works	Richmond Main Sew. B.	J. C. Melliss	June 4th	ii.
Tar Pavements	School Brd. for London	*Official*	Not stated...	viii.
Annual Repairs to Buildings, &c.	do.	do.	do.	viii.
Baptist Chapel, Hornsey	The Committee	J. W. Chapman	do.	viii.

PUBLIC APPOINTMENTS.

Nature of Appointment.	By whom Advertised.	Salary.	Applications to be in.	Page
Borough Surveyor	Hastings Cor.	400*l.*	May 7th	xiv.

DUDLEY.—For alterations to Morris's Horse Repository, for the "Salvation Army." Mr. E. J. Sherwood, architect and surveyor, 101, Queen Victoria-street, London, E.C.:—

W. Smith, Wolverhampton	£611 0 0
J. Light, Oldbury	584 0 0
J. Gittings, Tipton	559 0 0
H. Dorse & Son, Cradley Heath	539 0 0
Weale & Co., Ludlow	527 0 0
J. H. Bate & Son, Dudley	450 0 0
F. J. Coxhead, Leytonstone	425 0 0

EALING.—For the erection of fifteen houses in Bloomfield-road, for Mr. James Atlee. Mr. Charles Coppen, architect and surveyor, Ealing, W.:—

H. & A. J. Jones, Ealing	£4,400 0 0 !
B. Standish, Tooting	4,008 0 0
T. Nye, Ealing	3,850 0 0
A. Bailey, Ealing	3,798 10 0
W. Evans, Holloway	3,798 0 0
W. Down, Ealing	3,135 0 0
W. Waters, Ealing	2,997 0 0
A. Burrage, Brentford	2,989 0 0
J. Horwood, Ealing	2,942 0 0
J. Spackman, Ealing	2,930 0 0
J. Edwards, Ealing (accepted)	2,900 0 0 !

[Surveyor's estimate, 3,040*l.*]

ENFIELD.—For the erection of dwelling-houses at Enfield, for Mr. Brewster. Messrs. Searle, Halton, & Bowyer, architects and surveyors, Tottenham and Enfield:—

	For One House.	For Four Houses.
P. Coote	£268	£1,020
E. Smithers	244	964
Harrison & Crabb	233	828

ENFIELD.—For the erection of a dwelling-house at Chase-side, Enfield, for Mr. W. G. Wood. Messrs. Searle, Halton, & Bowyer, architects and surveyors, Tottenham and Enfield:—

J. Ashby	£385 17 0
Harrison & Crabb	338 0 0
P. Coote	285 0 0

GORING.—For alterations and additions to Streatley-view, for Mr. W. B. Hallett. Mr. W. Ravenscroft, architect:—

J. Smallbone, Streatley	£393 0 0
J. Bottrill, Reading	390 0 0
T. Higgs, Goring	389 0 0
A. W. Dodd, Caversham*	378 10 0

* Accepted, subject to a few modifications.

GRANBY (Nottinghamshire).—For the restoration of All Saints' Church. Mr. Edward Turner, 21, Hart-street, Bloomsbury, London, architect:—

	If Hollington stone be used.	If Ancaster stone be used.
Smith & Lunn, Newark-on-Trent	£1,200 0	£1,100 0 0
H. Vickers, Nottingham	—	1,029 19 5
H. Green, Nottingham (accepted)	958 10	948 10 0

HAMPTON.—For the erection of a boat-shed and offices, at Hampton-on-Thames, Middlesex, for Mr. Charles Constable. Mr. Walter J. Ebbetts, architect, No. 115, Strand:—

J. Woodward, Finsbury	£677 0 0
H. Baylis, Highbury	658 0 0
J. Wheatley & Sons, East Molesey	615 0 0
H. Harmer, Wimbledon (accepted)	577 0 0

HENDON.—For building Wesleyan Chapel, keeper's house, and Sunday schools, Hendon. Messrs. Purves & Done, architects, 10, Finsbury-pavement, E.C. Quantities supplied:—

J. S. Kimberley, Banbury	£8,000 0 0
Staines & Son, Great Eastern-street, E.C.	7,982 0 0
W. A. Pryor, Kilburn	7,919 0 0
E. Toms, Camden Town	7,639 0 0
W. Oldrey & Co., Westbourne Park	7,637 0 0
Bateman & Hicks, Ramsey, Hunts...	7,586 0 0
R. G. Battley, Old Kent-road, S.E...	7,499 0 0
W. L. Kellaway, Islington	7,438 0 0
Barrett & Power, Hackney	7,265 0 0
G. Stephenson, Bishopsgate-street, E.C.	7,226 0 0
Everett & Son, Colchester	7,208 0 0
Shillitoe & Son, Bury St. Edmunds...	7,005 0 0
W. M. Dabbs, Stamford Hill	6,964 0 0
Allen & Sons, Kilburn	6,755 0 0

HORNSEY.—For the erection of premises in the High-street, for the Hornsey National Hall Company. Mr. John Farrer, architect and surveyor, 20, Finsbury-pavement, E.C.:—

J. W. Dixon	£3,985 0 0
W. Brass & Son	3,959 0 0
J. T. Chappell	3,921 0 0
Clarke & Bracey	3,882 0 0
Patman & Fotheringham	3,763 0 0
J. Hall	3,280 13 0
J. Smith & Sons	3,069 0 0
McFarlane Bros.	3,032 0 0
Mattock Bros.	2,993 0 0
Reynolds	2,977 0 0
J. Docwra & Son (accepted)	2,900 0 0

KINGSTON-ON-THAMES.—For paving works at Messrs. R. White & Son's new factory, Fife-road, Kingston-on-Thames. Mr. C. W. Lovett, architect:—

W. H. Wheeler, 11, Queen Victoria-street, E.C. (accepted)	£460 0 0

LEAMINGTON.—For the erection of house at Milverton, near Leamington Priors, for Major R. Warner Brooks. Mr. Jethro A. Cossins, architect. Quantities by Mr. George Kenwrick, 83, Colmore-row, Birmingham:—

Tallis Bros., Warwick	£6,166 0 0
J. Moffat, Birmingham	6,069 0 0
Lessaman, Leamington	5,768 0 0
R. Thompson, Kidderminster	5,648 19 0
Sapcote & Son, Birmingham	5,365 0 0
Parnell & Son, Rugby	5,310 0 0
W. & J. Webb, Birmingham	5,213 0 0
Jenkins & Son, Leamington	5,139 0 0
G. & F. Smith, Milverton	5,060 0 0
Barnsley & Sons, Birmingham	4,997 0 0
J. Fell, Leamington	4,815 0 0
H. Lovatt, Wolverhampton*	4,737 0 0

* Accepted.

LEICESTER.—For the erection of additional cattle lairs, at the Cattle Market, for the Corporation of Leicester. Plans, specification, and quantities by Mr. J. Gordon, M.Inst.C.E., Borough Surveyor:—

Alf. Plant, Leicester	£545 15 0
S. & E. Bentley, Leicester	501 6 6
Hy. Black, Barrow-on-Soar	498 0 0
J. O. Jewsbury, Leicester	493 19 0
E. B. Pipes, Leicester	493 10 0
T. & H. Herbert, Leicester	481 0 0
J. Stevens, Leicester	485 11 3
W. Gimson & Sons, Leicester	476 0 0
Jno. Attenborough, Nottingham	463 0 0
Geo. Duxbury, Leicester (accepted)	439 0 0

LONDON.—For erecting a new warehouse, shop, and other works, at Great Alie-street and Tenter-street North, E., for Mr. Samuel Moses. Messrs. Dunk & Geden, architects, 36 and 37, Leadenhall-street, E.C.:—

W. & H. Castle	£3,249 0 0
Wm. Gregar	3,000 0 0
S. Yardley & Son	2,970 0 0
Geo. Stephenson	2,930 0 0
W. H. Lascelles & Co.	2,900 0 0
J. W. Sawyer	2,888 0 0
Staines & Son	2,864 0 0
W. R. King	2,859 0 0
R. Edwards & Co.	2,800 0 0
J. & C. Bowyer	2,763 0 0
F. & H. F. Higgs	2,700 0 0
J. Holland	2,629 0 0
S. J. Jerrard	2,629 0 0
E. Lawrance & Sons	2,595 0 0
Geo. Munday & Son	2,578 0 0
Perry & Co.	2,574 0 0
W. M. Dabbs	2,524 0 0
W. & F. Croaker	2,500 0 0
S. Sabey & Son	2,497 0 0
Coulsell Bros.	2,473 0 0
J. R. Hunt	2,465 0 0
Green & Lee	2,333 0 0
H. L. Holloway (accepted)	2,323 0 0

LONDON.—For paving works at Mr. H. Goddard's new stables, Old Kent-road. Mr. C. W. Lovett, architect:—

W. H. Wheeler, 11, Queen Victoria-street, E.C. (accepted)	£266 15 0

LONDON.—For draining and paving works at Messrs. R. White & Son's new factory, Neate-street. Mr. C. W. Lovett, architect:—

W. H. Wheeler, 11, Queen Victoria-street, E.C. (accepted)	£1,127 0 0

LONDON.—For the erection of new premises, Charing Cross-road, for Messrs. Alderman, Johnson & Co., Limited. Mr. John Waldram, surveyor, 16, Craven-street, W.C.:—

Kennard Bros., Lewisham (accepted)	£4,350 0 0

LUTON.—For alterations to the present, and one new residence at side, Upper George-street, for Mr. J. Huckle. Mr. W. J. Pearson, Market Hill, architect:—

D. Parkins, Luton (accepted)	£449 0 0

[Lowest of eight tenders received].

ORPINGTON (Kent).—For sundry works to property at High-street, Orpington, Kent. Mr. St. Pierre Harris, architect and surveyor, 1, Basinghall-street, E.C.:—

Hart Bros.	£144 10 0 !
Knight	105 2 0
Treadwell	91 12 0
Taylor	87 3 4
Page	85 0 0
Hutchings	77 10 0
Hewett	76 15 6
Heath	75 14 8
Hammond & Son (accepted)	65 0 0 !

ORPINGTON (Kent).—For repairs to property at High-street, Orpington, Kent. Mr. St. Pierre Harris, architect and surveyor, 1, Basinghall-street, E.C.:—

	For General Repairs.	Private Residence only.
Somerford & Son	£197 0	*£98 0
Page	186 6	—
Hart Bros.	183 0	105 0
Taylor	*154 15	110 5

* Accepted.

PANGBOURNE.—For new house, &c., for Mr. W. Wethered. Mr. W. Ravenscroft, architect, Reading. Quantities supplied by Messrs. Cooper & Sons, of Maidenhead:—

T. Boxall, Pangbourne	£1,400 0 0
J. Smallbone, Streatley	1,354 0 0
T. Higgs, Goring	1,350 0 0
A. W. Dodd, Caversham	1,348 10 0
B. Warner, Pangbourne	1,347 0 0
C. F. Kearley, London	1,332 0 0
W. Hearn & Co., London	1,250 0 0
J. Bottrill & Son, Reading*	1,250 0 0
J. C. Cook, Reading†	1,079 0 0

* Accepted, subject to a few modifications.
† Withdrawn.

PENRHIWCEIBER (near Mountain Ash).—For workmen's institute and public hall, at Penrhiwceiber, near Mountain Ash. Mr. Edward H. Bruton, architect, Cardiff:—

Jones Bros. & Co.	£1,672 0 0
C. Shepherd & Son	1,645 0 0
D. Davies	1,620 0 0
T. Gough	1,480 0 0
D. Harris	1,467 0 0
C. Jenkins & Son	1,460 0 0
T. Rees	1,419 0 0
Batchellor & Snowden (accepted)	1,400 0 0
Abraham George (withdrawn)	1,364 0 0

RAMSGATE.—For a detached residence at Ramsgate, for Mr. W. M. Boyton. Mr. W. S. Barwick, architect, Ramsgate:—

T. Elgar	£1,450 0 0
J. E. Barwick	1,249 0 0
Paramor & Son	1,170 0 0
J. Newby	1,034 0 0
W. W. Martin	895 0 0
J. H. Forwalk (accepted)	831 10 0

RADFORD (Notts).—For St. Michaels and All Angels' Church, Radford, Nottingham. Messrs. Habershon & Fawckner, architects:—

	First Contract.	Second Contract.	Total.
Gregar, Stratford ...	£4,997	£1,397	£6,394
Edwards, Leominster	4,875	1,409	6,284
Jones & Co., Gloucester	4,490	1,361	5,851
Fecitt, Blackburn ...	4,350	1,400	5,750
Bentley, Waltham Abbey	4,286	1,217	5,503
Smith & Lunn, Newark	4,000	1,250	5,250
Fish & Son, Nottingham	3,859	1,391	5,250
Bell & Son, Nottingham	3,776	1,158	4,934

READING.—For alterations and additions to premises, London-street, for Messrs. E. Gibbons & Son. Mr. W. Ravenscroft, architect:—

D. Taylor	£280 0 0
G. Lewis	243 0 0
Higgs & Sons	221 0 0
G. Searle*	210 0 0

* Accepted, subject to a few modifications.

[All of Reading].

SHADWELL.—For re-building a warehouse, at No. 290, Cable-street, Shadwell, E., for Major Lowndes. Messrs. I'Anson & Sons, architects:—

Charteris	£2,287 0 0
Patman & Fotheringham	2,173 0 0
Balsam Bros.	2,150 0 0
Adamson & Son	2,097 0 0
Ryder	2,090 0 0
Kynoch & Co.	2,090 0 0
Grover	2,084 0 0
Nightingale	2,083 0 0
Johnson	1,997 0 0
Kirk & Randall	1,990 0 0
Ashby & Horner	1,986 0 0

SHOREHAM (Kent).—For erection of new cottages and repairs to old property, at Shoreham, Kent. Mr. St. Pierre Harris, architect and surveyor, 1, Basinghall-street, E.C.:—

Somerford & Son	£925 0 0
Everest & Marchant	835 0 0
Durtnell	735 0 0
Wood	700 0 0
Knight	690 0 0
Taylor & Son	648 0 0
Owen*	575 19 0

* Accepted, subject to modification.

SHORTLANDS (Kent).—For completing two houses in Shortlands, Kent. Mr. G. W. Cooper, architect:—

Illingworth & Co., Finsbury (accepted)	£1,276 10 0

TULSE HILL.—For the decoration of a hall, &c., at Elm Court. Mr. Christopher M. Shiner, architect, 15, New Broad-street:—

Vanstone	£112 0 0
Kitzerow	109 0 0
Bristow	108 10 3

VAUXHALL.—For pulling down and rebuilding the Prince of Wales beer-house, Vauxhall. Mr. J. A. J. Woodward, architect:—

J. & J. Greenwood	£756 0 0
Scutt	650 0 0
Ford & Sons	609 0 0
Purkiss	595 10 0
Tyerman	592 0 0
Hooper	572 10 0
Beale	571 0 0
Larcombe	566 0 0

WIMBLEDON.—For the erection of houses at Cottenham Park, Wimbledon. Mr. Alfred G. Olley, architect, Wimbledon:—

H. Ridd	£777 0 0
J. Sullock	735 0 0
G. Cole, Cottenham Park (accepted)	720 0 0

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